BANK OF GHANA

Guideline On the Management and Measurement of Interest Rate Risk in The Banking Book (IRRBB)

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for Banks, Savings and Loans, Finance Houses, Finance and Leasing and Financial Holding Companies

(EXPOSURE DRAFT)

February 2026

The Bank of Ghana (BOG) has issued the **Guideline On the Management and Measurement of Interest Rate Risk in The Banking Book (IRRBB)** to solicit comments and inputs from the banking industry and the general public, in line with the BOG's Procedures for Issuance of Directives, 2020.

In light of this, the Exposure Draft shall be made available on the BOG's website at www.bog.gov.gh from date of publication to June 30th, 2026, for comments.

All comments shall be sent to the Bank of Ghana via email at bsdletters@bog.gov.gh by 30th June 2026. The Bank of Ghana shall consider all material comments received and provide a written explanation for comments that were incorporated into the final guideline or otherwise.

PREAMBLE

Banks and specialised deposit-taking institutions (SDIs), hereinafter referred to as Regulated Financial Institutions (RFIs), in their normal course of business are exposed to various risks which can have significant impact on their capital and earnings. Interest Rate Risk is the exposure of RFIs' financial condition (capital and earnings) to adverse movements in interest rate. This risk may impact RFIs' banking book (Interest Rate Risk in the Banking Book) and/or trading book. Specifically, the expectation is that when interest rates change in the banking book, the Present Value (PV) and timing of future cash flows also change. This in turn changes the underlying value of RFIs' assets, liabilities and off-balance sheet items and hence its Economic Value (EV). Changes in interest rates also affect RFIs' earnings by altering interest rate-sensitive income and expenses, affecting its Net Interest Income (NII). Hence, excessive interest rate risk in the banking book if not well-managed, can pose a significant threat to RFIs' capital position and future earnings.

In April 2016 the Basel Committee on Banking Supervision (BCBS) issued new standards on IRRBB which replaced the 2004 principles for the management and supervision of interest rate risk. These standards updated the principles and methods expected to be used by RFIs for identification, measurement, monitoring, reporting and control of interest rate risk as well as its supervision.

Under the new BCBS standards, RFIs are required to calculate their IRRBB exposures based on the impact on economic value of equity (EVE) under a set of prescribed interest rate shock scenarios, either using the standardised framework or internal models. RFIs that have IRRBB exposures exceeding 15% of their Tier 1 capital are identified as "outliers" and considered as potentially having undue IRRBB and subject to supervisory review. In addition, RFIs are required to disclose their IRRBB exposures to the public on a regular basis.

This Guideline, which is consistent with the BCBS standards on IRRBB, sets out supervisory requirements for RFIs aimed at ensuring effective management and measurement of IRRBB. This includes, amongst others, specific expectation in relation to:

a) governance, risk management and internal control arrangements for the management of IRRBB;
b) systems that RFIs should implement to facilitate effective identification, management, measurement and reporting of IRRBB;
c) supervisory reporting of IRRBB;
d) disclosure of IRRBB; and
e) internal assessment of capital adequacy for IRRBB[1].

[1] Applicable only to banks.

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PART 1 - PRELIMINARY

Title

1. This Guideline shall be cited as the Bank of Ghana Guideline on the Management and Measurement of Interest Rate Risk in the Banking Book, 2026.

Application

2. This Guideline is issued pursuant to section 92(1) of the Banks and Specialised Deposit-Taking Institutions Act, 2016 (Act 930).

3. This Guideline shall apply to banks, savings and loans companies, finance houses, finance and leasing companies as well as financial holding companies (FHCs) licenced and registered under Act 930, hereinafter referred to as Regulated Financial Institutions (RFIs).

4. This Guideline shall be read in conjunction with the Bank of Ghana (BOG) Risk Management Directive 2021 and other relevant BOG directives and guidelines.

5. Given that interest rate risk arising from trading book exposure is covered under Pillar 1 market risk requirements, the focus of this Guideline is only on interest rate risk arising from banking book exposures.

Definitions and Interpretation

6. In this Guideline, unless the context otherwise requires, words used have the same meaning as that assigned to them in the applicable laws (e.g., Act 930) or as follows:

"Act 930" *means the Banks and Specialised Deposit-Taking Institutions Act, 2016 (Act 930).*

"Amenable to Standardisation" *means banking book positions with certain cash flow until its maturity or repricing date.*

"Basis Risk" *means the impact of relative changes in interest rate for financial instruments that have similar tenors but are priced using different interest rate indices.*

"BOG" *means the Bank of Ghana.*

"Board" *means the Board of Directors of a Regulated Financial Institution.*

"Banking Book" *means instruments not in the trading book. The BCBS standards on minimum capital requirements for market risk (January 2016) defined trading book as one comprising instrument held for one or more of the following purposes:*

a) short-term re-sale;
b) profiting from short-term price movements;
c) locking in arbitrage profits; and
d) hedging risk that arise from the above.

"Constant Balance Sheet" *means the total balance sheet size and shape maintained by assuming like-for-like replacement of assets and liabilities as they run off.*

"Credit Spread Risk in the Banking Book (CSRBB)" *means risk driven by changes of the market price for credit risk, liquidity and for potentially other characteristics of credit-risky instruments, which is not captured by another existing prudential framework such as IRRBB or by expected credit/(jump-to-) default risk. CSRBB captures the risk of an instrument's changing spread while assuming the same level of creditworthiness, i.e. how the credit spread is moving within a certain rating/Probability of default (PD) range.*

"Economic Value of Equity (EVE)" *means the present value of assets minus the present value of liabilities plus off-balance sheet items, which measures the change in market value of equity resulting from fluctuations in interest rates.*

"Gap Risk" *means risk that arises from the term structure of banking book instruments and describes the risk arising from the timing of instrument rate changes.*

"Interest Rate Risk on the Banking Book (IRRBB)" *means the current or prospective risk to an RFI's capital and to its earnings, arising from the impact of adverse movements in interest rates on its banking book.*

"Less Amenable to Standardisation" *means banking book positions with optionality that makes the timing of notional repricing of cash flows uncertain.*

"Material Risks" *means risks that could have a significant impact, both financial and non-financial, on the institution and its subsidiaries or on the interests of depositors and other stakeholders.*

"Non-Maturity Deposits (NMD)" *means deposits which can be withdrawn, with or without penalty, at the discretion of the depositor.*

"Not Amenable to Standardisation" *means banking book positions that are driven by customer behavioural changes which includes Non-maturity deposits (NMDs), fixed rate loans subject to prepayment risk and term deposits subject to early redemption risk.*

"Option Risk" *means risk that arises from option derivative positions or from the optional elements embedded in some assets, liabilities and off-balance sheet items, where the bank or its customers can alter the level and timing of cash flows.*

"Regulated Financial Institutions (RFI)" *means a Bank, Savings & Loans Companies, Finance and Leasing Companies, Finance House Companies And Financial Holding Companies licenced or registered under Act 930.*

"Risk Appetite" *means the aggregate level and types of risk an RFI is willing to assume, decided in advance and within its risk capacity, to achieve its strategic objectives and plan.*

"Risk Appetite Framework (RAF)" *means the overall approach, including policies, processes, controls and systems, through which the approved risk appetite is established, communicated and monitored. It includes a risk appetite statement, risk limits and an outline of the roles and responsibilities of those overseeing the implementation and monitoring of the RAF. The RAF should consider material risks to the RFI as well as to its reputation vis-à-vis depositors and other stakeholders. The RAF should align with the RFI's strategy.*

"Risk Limits" *means specific quantitative measures or limits based on, for example, forward-looking assumptions that allocate the RFI's aggregate risk to business lines, legal entities as relevant specific risk categories, concentrations and, as appropriate, other measures.*

"Risk Management" *means the processes established to ensure that all material risks and associated risk concentrations are identified, measured, evaluated, controlled, mitigated and reported on a timely and comprehensive basis.*

"Risk Management Framework" *means the totality of systems, structures, policies, processes and people within an institution that identify, measure,*

evaluate, control or mitigate, monitor and report all internal and external sources of material risk.

"Risk Profile" *means point-in-time assessment of an RFI's gross risk exposures (i.e. before the application of any mitigants) or, as appropriate, net risk exposures (i.e. after taking into account mitigants) aggregated within and across each relevant risk category based on current or forward-looking assumptions.*

"Run-off Balance Sheet" *means a balance sheet where existing non-trading book positions amortised and are not replaced by any new business.*

"Senior Management" *means members of the Executive Management Committee (EXCO) of an RFI and any other Key Management Personnel as may be determined by the RFI.*

Objectives

7. The objectives of this Guideline are to:

a) Ensure RFIs establish an appropriate framework for managing, measuring, monitoring, controlling and reporting of IRRBB in line with BCBS standards on interest rate risk in the banking book;

b) Set out the expectations for market disclosures to ensure consistency, transparency and comparability across RFIs; and

c) Specify the approaches to be used by RFIs in their internal assessment of capital requirements for IRRBB under Pillar 2 of the Basel Capital Framework.

Proportionality

8. RFIs should align their management and measurement of IRRBB processes with the requirements of this Guideline. However, in assessing the quality of RFIs' IRRBB framework, the BOG will consider the principle of proportionality. In particular, the assessment will be aimed at ensuring that:

a) RFIs' processes and methodologies for managing and measuring IRRBB are commensurate with their nature, risk profile, systemic importance and business model, as well as the scale and complexity of their activities; and

b) the regulatory objectives of promoting safety and soundness of RFIs and ensuring the stability of the financial system are effectively achieved.

Transitional Arrangements and Implementation Date

9. This Guideline shall take effect from **1st January 2027**.

10. RFIs shall pilot the provisions of this Guideline for a period of one (1) year following its publication and submit quarterly reports to the BOG in the prescribed templates in Appendix IV.

11. At the end of the pilot period, RFIs will submit quarterly reports to the BOG not later than nine (9) days after the ensuing quarter.

PART II – GOVERNANCE AND RISK MANAGEMENT FRAMEWORK

Governance

12. RFIs should establish effective governance arrangements to oversee and manage their IRRBB and ensure sufficient resources are allocated to support the management and measurement of IRRBB.

13. RFIs should document the governance arrangements for the management and measurement of IRRBB which includes the organizational structures, responsibilities, policies, procedures and processes to effectively oversee and manage IRRBB.

Roles and Responsibilities of the Board

14. The Board is ultimately responsible for the oversight of the IRRBB management framework and risk appetite. BOG therefore expects the RFI's Board to be accountable for ensuring that:

a) Board members understand the nature and the level of the RFI's IRRBB exposures including its implication on the RFI's exposure and strategies. This include ensuring that individual Board members have sufficient technical knowledge to effectively challenge RFI's IRRBB reports;

b) It approves and periodically reviews the appropriateness of the RFI's overall IRRBB policies including ensuring alignment of such policies with the RFI's broad strategies[2] and risk appetite;

c) There is clear guidance on the acceptable level of IRRBB for the RFI given its business strategies, capital and liquidity position and risk management capacity;

d) Appropriate steps are taken by the RFI to identify, measure, monitor and control IRRBB in line with the Board approved strategies and policies, and BOG expectation;

e) Senior management has the capability and skills to understand IRRBB, and that adequate resources are devoted to IRRBB management[3];

f) Assess the performance of senior management in monitoring and controlling interest rate risk in compliance with approved strategies and policies;

[2] Including business and risk management strategies.

[3] The board and/or senior management should ensure that analysis and risk management activities related to IRRBB are conducted by competent staff with technical knowledge and experience consistent with the nature and scope of the bank's activities.

g) Appropriate limits on IRRBB, including the definition of specific procedures and approvals necessary for exceptions are in place, and that the RFI complies with the set limits on IRRBB;

h) The systems and standards for measuring IRRBB, valuing positions and assessing performance, including procedures for updating interest rate shock and stress scenarios and key underlying assumptions driving the institution's IRRBB, are robust;

i) There is adequate separation of responsibilities in key elements of risk management process to avoid conflicts of interest, and that roles and responsibilities for managing IRRBB are clearly identified, defined and documented;

j) RFI's organisation structure enables Senior Management and the relevant committees including asset and liability management committee (ALCO) to carry out their responsibilities and facilitates effective decision-making and good governance. Such committees should meet regularly and include:

   i) representatives from each of the major departments involved in the management of IRRBB; and
   ii) members with clear lines of authority over the units responsible for establishing and managing banking book positions.

k) There is a comprehensive process for the review and reporting of IRRBB to ensure that the Board is informed regularly and at least on a quarterly basis on the level and trend in the RFI's IRRBB exposures; and

l) Effective internal controls and management information systems (MIS) are implemented and regularly reviewed by an independent audit function (internal or external auditors)[4].

Roles and Responsibilities of Senior Management

15. Senior Management must ensure the effective implementation of IRRBB management and measurement framework, and that staff involved in its implementation have a sound understanding of the framework.

16. In managing IRRBB, Senior Management should at a minimum:

    a) develop and implement policies and procedures that translate the Board's goals, objectives, and risk limits into operating standards that are

[4] An adequate IRRBB management framework should involve regular independent reviews and evaluations of the effectiveness of the system.

well understood by staff and are consistent with the Board approved business and risk management strategies;

b) oversee the implementation and maintenance of MIS that measure, monitor, control and report the RFI's IRRBB;

c) establish and maintain effective internal controls over the IRRBB management process;

d) monitor the RFI's overall interest rate risk profile and ensure that the level of interest rate risk is maintained at prudent levels;

e) ensure that the RFI's operations and activities are conducted by competent staff with technical knowledge and experience consistent with the risk profile, size and complexity of the RFI's activities;

f) provide the Board with regular reports and briefings on the RFI's IRRBB related activities and risk exposures including utilisation of the established limits and any exceptions; and

g) review at least, annually, the RFI's risk management systems, including related policies, procedures, and risk limits.

Risk Management Policies, Procedures and Controls

17. The specifics of IRRBB management framework may differ across RFIs depending on the size, nature and complexities of their asset and liability position as well as risk profile. Nonetheless, a comprehensive IRRBB management framework requires the following:
    a) appropriate Board and Senior Management oversight;
    b) adequate risk management policies and procedures;
    c) appropriate risk identification, measurement, monitoring and control functions; and
    d) comprehensive internal controls and independent audits.

18. The use of risk management instruments (including forwards, futures, options and swaps) to mitigate IRRBB should take into account the nature and extent of interest rate risk activities, the skills and experience of management, and the capacity of the interest rate risk reporting and control systems.

19. The RFI's risk appetite for IRRBB should take into account risk to both economic value and earnings and should be expressed through appropriate policy limits and internal controls.

20. The policy limits for IRRBB should be approved by the Board and implemented through a comprehensive risk appetite framework. These limits should be:

    a) consistent with the RFI's overall approach for measuring IRRBB; and
    b) appropriate to the RFI's nature, size, complexity of its activities, capital adequacy, and its capacity to manage and measure its risks.

21. RFIs should also set IRRBB limits for individual business units, portfolios, instrument types or specific instruments depending on the nature, size and complexity of their activities and business models.

22. RFIs should ensure that the risk limits for IRRBB reflect the characteristics of their holdings, including the relevant sources of IRRBB exposures. RFIs with significant exposures to gap risk, basis risk or option risk should also establish risk appetite appropriate for these risks.

23. Where applicable, the RFI's aggregate risk limits, clearly articulating the amount of IRRBB acceptable to the Board, should be applied on a consolidated basis and, as appropriate, at the individual entity level.

24. Where limits are associated with specific changes in interest rates scenario and/or term structures such as an increase or decrease in size or a change in shape, the interest rate movements used in developing such limits should represent meaningful shock and stress situations taking into account historical interest rate volatility and the time required by management to mitigate those risk exposures.

25. RFIs should have systems in place to ensure that positions that exceed, or are likely to exceed limits that have been defined and approved by the Board or its delegates (senior management or ALCO) receives prompt management attention and is escalated without delay. There should also be a clear policy on who will be informed, how communication will take place and the actions to be taken in response to an exception.

26. The management of IRRBB should also be integrated within its broader risk management framework and aligned with its strategic planning and budgeting activities.

27. Where material, Credit Spread Risk in the Banking Book (CSRBB) should also be properly monitored, assessed and managed by RFIs.

Internal Controls and Independent Review

28. RFIs should have internal controls for IRRBB to ensure efficient and effective management of inherent risk, timely and accurate management and regulatory reporting, and compliance with the relevant laws, regulations and internal policies. Specifically, RFIs should have:

    a) Appropriate approval process, exposure limits, and review mechanisms, amongst other controls, aimed at providing reasonable assurance that the RFI's risk management objectives are being achieved;

    b) Regular evaluations and reviews of their internal control system and risk management process to, amongst others, address any significant changes that may affect the effectiveness of internal controls[5];

    c) Appropriate escalation procedures for any limit breaches; and

    d) Their IRRBB identification, measurement, monitoring and control processes subject to regular and independent review by the Internal Audit Function (IAF) and/or an external reviewer approved by BOG[6].

29. Audit findings in relation to IRRBB should be reported to the Board Audit Committee and senior management, with actionable recommendations and timelines for remediation. The IAF should also maintain sufficient expertise and resources to effectively challenge IRRBB-related management processes and controls.

30. Independent reviews and audits in relation to IRRBB should be conducted at least annually, with frequency adjusted based on material changes in the RFI's risk profile and macroeconomic conditions.

31. The following factors should be considered by the independent audit function or BOG approved external reviewer in their risk assessments:

    a) the volume and price sensitivity of various products;

    b) the vulnerability of earnings and capital under different interest rate shocks including changes in yield curve;

    c) the exposure of earnings and economic value to various forms of interest rate risk, including gap, basis and option risks;

[5] This includes changes in market conditions, personnel, technology and structure of compliance with exposure limits.

[6] These reviews should cover, amongst other aspects, the adequacy of risk identification and measurement methodologies, the robustness of model validation and stress testing practices, and compliance with Board-approved policies and procedures.

d) the extent of the Board and senior management involvement in the risk management process;
e) the comprehensiveness of an RFI's documented IRRBB policies, controls and procedures and the extent of alignment of practices with these policies, controls and procedures;
f) the appropriateness of the RFI's risk measurement system including limit structure given the nature, scope and complexity of its activities;
g) the process for monitoring compliance with the set limits and escalation process for any limit breaches;
h) the timeliness, accuracy and completeness of the data inputs into the RFI's risk measurement system, robustness of the methodology including underlying formulas, and reliability of data aggregation process; and
i) the reasonableness of the assumptions and severity/plausibility of scenarios used in the risk measurement system.

PART III – MEASUREMENT OF IRRBB[7]

Components of IRRBB

32. IRRBB is a material risk for banks, which should be considered under Pillar 2 of the Basel Capital Framework. Banks should therefore measure and ensure that they set aside sufficient capital buffers to absorb losses from adverse interest rate movements.

33. IRRBB can arise from a variety of sources and financial transactions and consists of three main types:

a) Gap risk results from mismatches in the timing of interest rate changes across interest-sensitive banking book instruments. The magnitude depends on whether changes in the term structure of interest rates occur uniformly across the yield curve (parallel risk) or vary by maturity (non-parallel risk). There is a risk to the when the rate of interest paid on liabilities increases before the rate received on assets (or reduces on assets before liabilities)

b) Basis risk occurs when financial instruments with similar tenors are priced using different interest rate indices. Relative changes in these indices can lead to unexpected variations in cash flows.

c) Option risk arises from option derivative positions or from optional features embedded in a bank's assets, liabilities or off-balance sheet items. These options grants either the bank or its customer to flexibility to modify the level and timing of their cash flows. Option risk can be further classified into:

i. Automatic option risk: stemming from contractual options explicitly defined in financial instruments; and
ii. Behavioural option risk: resulting from customer action, such as early repayments or premature deposit withdrawals.

Measurement Systems and Data Integrity

34. Banks' should measure IRRBB using both economic value and earnings-based measures, applying a wide and appropriate range of interest rate shocks and stress scenarios including those mandatory in **Appendix II** and, where feasible, the suggested additional scenarios in **Appendix III**[8]. The choice of

7 This part shall only apply to banks.

8 The economic value (EV) measures mainly focus on valuing the cash flows arising from existing assets and liabilities under different future interest scenarios while ignoring future business flows while earnings-based measures look at the expected increase or decrease in net interest income (NII) over a shorter time horizon (typically one to three years) resulting from interest rate movements that are composed of either a gradual or a non-time large interest rate shock.

measurement system should reflect the bank's nature, scale, business mix and the risk characteristics of its activities.

35. Banks' IRRBB measurement systems and models should be based on accurate data, and supported by comprehensive documentation, rigorous testing, and robust internal controls to ensure reliability and accuracy of all calculations. Banks' measurement system for IRRBB should also:

    a) capture interest rate risk data across all material IRRBB exposures of the bank[9];

    b) support the computation of both economic value and earning-based measures of IRRBB based on multiple scenarios including: the mandatory interest rate shock scenarios **(Appendix II)**, historical and hypothetical interest rate stress scenarios, internal interest rate shocks that captures the bank's risk profile, and any additional interest rate shock scenarios that may be prescribed by BOG including those suggested in **Appendix III**; and

    c) enable timely and accurate retrieval of IRRBB-related information by the bank.

36. Banks should implement a robust internal validation framework for their measurement systems and models. The frameworks should include methodological evaluation, ongoing model monitoring, and analysis of model outputs. All internal models and tools used to assess IRRBB including the relevant Pillar 2 capital add-on should be governed by a comprehensive model risk management process, which includes an independent validation function – undertaken either by internal audit or a dedicated risk review function – to ensure objectivity.

37. Where applicable, the model validation function should be organisationally independent from model development and business units. It should have sufficient expertise and authority to rigorously assess model assumptions, methodologies, and outputs.

38. At a minimum, the validation process should include: a review of model documentation and governance; verifying data quality and input integrity; backtesting[10] against historical outcomes; conducting benchmarking and sensitivity analysis; and assessing behavioural assumptions.

[9] Banks should pay particular attention to the complementary nature of economic value and earnings-based measures in their risk and internal capital assessments.

[10] The validity of the risk measurement calculations is often tested by comparing actual versus forecasted results

39. Validation, where applicable, should be conducted at least annually, or more frequently following material changes to the model or significant shifts in the interest rate environment. Validation results and key findings should be reported to the Board or Risk Committee and senior management to support oversight and decision-making.

40. The primary data sources used in the bank's risk measurement process should be clearly documented. To ensure data integrity, data input should be automated where possible. Additionally, data mapping process should undergo regular review and testing. The criteria for slotting cash flows into, for example, different time buckets should remain consistent over time to ensure reliability and comparability[11].

Behavioural and Modelling Assumptions

41. Where applicable, banks should ensure that their key behavioural and modelling assumptions underpinning their IRRBB measurement systems are fully understood, conceptually sound and reasonable, consistent with historical experience, and well documented. In particular, banks should make sound and reasonable judgments and assumptions when assessing how an instrument's actual maturity or repricing behaviour may deviate from its contractual terms due to behavioural optionalities[12]. Generally, assumptions may be made in relation to:

    a) expectation for the exercise of interest rate options (explicit and embedded) by both the bank and its customers under specific interest rate shocks and stress scenarios;

    b) treatment of balances and interest flows arising from NMDs;

    c) treatment of the bank's own equity within economic value measures; and

    d) the implications of accounting practices for IRRBB.

42. To determine the appropriate assumptions for its NMDs, banks should conduct a thorough analysis of their depositor base to identify the proportion of core deposits (i.e., NMDs which are unlikely to reprice significantly even under substantial changes in interest rate environment). These assumptions should be tailored based on depositor characteristics (retail versus wholesale) and account characteristics (transactional versus non-transactional).

[11] This is to allow for a meaningful comparison of risk figures over different periods.

[12] Common products with behavioural optionalities include: fixed rate loans subject to prepayment risk, fixed rate loan commitments, term deposit subject to early redemption risk and non-maturity deposits (NMDs)

43. Banks should routinely perform sensitivity analyses for key assumptions to evaluate their impact on IRRBB and such sensitivity analyses should consider both economic value and earnings-based measures.

44. Banks should review their key measurement assumptions at least annually and more frequently during periods of rapid changes in market conditions. This is important to account for evolving market conditions, competitive dynamics and shift in business strategy.

Interest rate Shock and Stress Scenarios

45. Banks should develop, implement and maintain a comprehensive and integrated stress testing framework for IRRBB. This framework should be an integral part of banks' overall risk management and governance process. The outcome of such stress testing should inform decision-making at appropriate management level, including strategic decisions of the Board and senior management. Additionally, IRRBB stress testing should be incorporated in banks' ICAAP[13].

46. The bank's IRRBB stress testing framework should include:

    a) clearly defined objectives aligned with the bank's risk appetite and strategic goals;

    b) scenarios tailored to the bank's specific business model and risk profile; and

    c) well-documented assumptions, and sound methodologies[14].

47. Banks should determine, by currency, a range of potential interest rate movements against which to measure their IRRBB exposures and should ensure that IRRBB is measured under a reasonable range of potential interest rate scenarios, including some containing severe stress elements. The interest rate scenarios should, ideally, reflect the prevailing term structure of interest rates, as well as historical and implied volatility of interest rates.

48. When developing interest rate shock and stress scenarios, banks should ensure that:

[13] As part of their ICAAP, banks are required to undertake rigorous, forward-looking stress testing that identified events of severe changes in market conditions which could adversely impact the bank's capital or earnings, possibly also through changes in the behaviour of its customer base.

[14] Banks stress testing framework for IRRBB should be commensurate with its nature, size and complexity as well as business activities and overall risk profile.

a) scenarios are severe but plausible, taking into account prevailing level of interest rates;

b) special attention is given to instruments and markets where concentration exist, as such position may be difficult to liquidate or hedge in stressed market conditions;

c) potential interactions between IRRBB and other related risks (such as credit and liquidity risks) are adequately captured; and

d) stress scenarios capture multiple simultaneous shocks to reflect contagion effects across risk types.

49. Banks should also consider performing both qualitative and quantitative reverse stress tests to identify:

a) interest rate scenarios that could severely threaten a bank's capital and earnings; and

b) vulnerabilities that could arise from interest rate hedging strategies and the potential behavioural reactions from its customers, where applicable.

50. The results of the bank's IRRBB stress testing exercise should inform the bank's risk appetite, capital and liquidity planning, contingency funding strategies, and strategic decision-making.

IRRBB as part of ICAAP

51. Banks are responsible for evaluating the level of additional capital (Pillar 2) that they should hold over and above the minimum requirements under Pillar 1, and for ensuring that the estimated capital is sufficient to cover IRRBB and its related risks. The overall level of capital should be commensurate with both the bank's measured level of risk (including for IRRBB) and its risk appetite and be duly documented in its ICAAP report.

52. Capital adequacy for IRRBB should be considered in relation to the risks to economic value, given that such risks are embedded in the bank's assets, liabilities and off-balance sheet items[15]. Where applicable, banks should also assess capital buffers for risks to future earnings, i.e., the possibility that future earnings may be lower than expected. The outcomes of the capital adequacy assessment for IRRBB should be considered and documented in the bank's ICAAP.

[15] Earnings-based measures do not necessarily identify the risks to capital that arise from revaluation of available-for-sale portfolios

53. In their capital adequacy assessment for IRRBB, banks should take into account the following, amongst others:

    a) the sensitivity of internal measurement of IRRBB to key modelling assumptions;

    b) the impact on economic value and NII of mismatched positions in different currencies;

    c) the impact of embedded losses;

    d) the drivers of underlying risk and circumstances under which the risk might crystallise; and

    e) the effectiveness and expected cost of hedging open positions that are intended to take advantage of internal expectations of the future level of interest rates, where applicable.

54. Measurement outcomes of IRRBB and, where applicable, hedging strategies should be reported to the bank's Board regularly and shall form part of the ICAAP submissions to BOG.

PART IV – REPORTING AND DISCLOSURES

Supervisory Reporting

55. Banks shall, on a quarterly basis, submit their IRRBB reports to the BOG as per the prescribed template (Appendix IV) not later than nine (9) days after the ensuing quarter.

56. Banks shall, on an annual basis, submit their IRRBB reports to BOG as part of their ICAAP reporting[16]. The IRRBB reports submitted to BOG should cover all major currencies in which the bank holds interest rate-sensitive positions[17]. For the purpose of this Guideline, a major currency is defined as each currency with material exposures accounting for more than 5% of the bank's banking book assets or liabilities.

57. Where a bank has opted to use internal models for quantification of IRRBB under Pillar 2, then it shall report the results of such models to BOG, detailing the impact on both economic value and earnings as part of their ICAAP submission. The bank should also report all material assumptions made in determining their internal estimates of risk and Pillar 2 capital for IRRBB.

58. Banks shall notify BOG of any significant changes proposed for internal limit structures for IRRBB, internal modelling systems or methodologies for quantifying IRRBB, and/or strategic or behavioural assumptions relating to the treatment of optionalities (explicit or embedded).

59. The ICAAP reports, which should be reviewed and approved by the Board, should include the outcome of IRRBB measurement system for every material currency in which the bank has exposures. Specifically, the reports should, at a minimum, contain the following:

    a) summary of the bank's aggregate IRRBB exposures, and explanations highlighting the assets, liabilities, cash flows, and strategies driving the level and direction of IRRBB exposure;

    b) comparison of IRRBB measurement outcomes with policy limits;

    c) key measurement and modelling assumptions such as NMD characteristics, prepayments on fixed rate loans and currency aggregation methods;

[16] The IRRBB reports should be done at the same entity level at which the (ICAAP) report has been prepared

[17] For example, Cedi, US Dollars, Euro, British Pound, Renminbi, etc

d) results of interest rate stress tests, including assessment of sensitivity of economic value and earning-based measures to key assumptions and parameters;

e) economic value and earning-based measures for interest rate shock and stress scenarios;

f) summary of the reviews of IRRBB policies, procedures and adequacy of the measurement systems, including any significant findings of internal and external auditors or other equivalent external parties; and

g) information on the range of maturities and currencies in each portfolio including off balance sheet items, trading and non-trading activities.

60. Banks are required to adopt the Standardised Framework (SF) for the assessment of IRRBB as outlined under **Appendix I (The Standardised Framework**) for supervisory reporting as part of the annual ICAAP submission. Banks may however use their Internal Measurement System (IMS) for the purposes of quantification and reporting of IRRBB under Pillar 2, where the following conditions are met:

a) The bank has appropriate model governance framework incorporating:

i. A formal model management policy approved by the Board;

ii. Specification of management roles and staff responsible for the development, validation, documentation, implementation and use of models for quantification of IRRBB;

iii. A robust process for the assessment of model risk; and

iv. A regular independent model review and validation. The validation process should particularly include evaluation of: conceptual and methodological soundness; ongoing model monitoring, including process verification and benchmarking; analysis of outcomes including backtesting of key internal parameters; and assessment of any expert opinions and judgments used in internal models

b) Interest rate risk metrics based on IMS and underlying assumptions are reported to the Board and Senior Management on a regular basis, and used to inform strategic and risk management decisions;

c) The IMS output should provide a sufficient and comprehensive representation of the bank's interest rate risk profile over a relevant time horizon;

d) The IMS output should allow for accurate assessment and effective monitoring of interest rate risk;

e) The model (IMS) reports the following key figures, amongst others:

i. Projected net interest income in the first and second year after the reporting date under the baseline interest rate scenario;

ii. The level of the bank's Own Funds under the baseline interest rate scenario;

iii. Earnings-at-Risk (EaR) in the first and second year after the reporting date, based on scenarios of gradual shifts away from the yield curve, over the course of twelve months, to a value of between 200-500 basis points above and below the baseline projection;

iv. Equity value changes based on stress scenarios projecting 200-500 basis point interest rate shocks in the form of parallel upward and downward shifts in the yield curve, taking into account effects caused by convexity and embedded options;

v. Price Value of 1 basis point (PV01) of the bank´s Own Funds under the baseline interest rate scenario; and

vi. Regulatory capital to cover IRRBB.

61. Where the estimated regulatory capital to cover IRRBB based on the bank's IMS is lower than that based on the Standardised Framework, then the bank should base its Pillar 2 regulatory capital for IRRBB on the outcome of the Standardised Framework.

Disclosures

62. Disclosures should adhere to principles of transparency, consistency, and comparability to enable effective market discipline and stakeholder understanding.

63. As part of its Pillar 3 disclosures, banks should disclose qualitative and quantitative information on an annual basis as per **Tables 7 and 8** respectively. The quantitative information should be based on the financial year end position (31st December). The following information on IRRBB should be disclosed to the market, at least annually:

a) Key methodologies and behavioural assumptions, including treatment of NMDs, prepayments, and embedded options;

b) Quantitative and Quantitative Measures;

i. Change in Economic Value of Equity ((ΔEVE) and Change in Net Interest Income (ΔNII) under the prescribed interest rate shock scenarios (see Appendix II);
ii. Overall quantitative and qualitative assessment of IRRBB levels; and

c) Stress Testing and Risk Management

i. Summaries of stress testing approaches, scenarios applied, and their impact on earnings and capital adequacy.

ii. Discussion of model limitations, uncertainties, and risk mitigation strategies.

iii. IRRBB levels based on the Standardised Framework.

iv. Practices for identifying, measuring, monitoring and controlling IRRBB.

64. Banks shall disclose the above information on their websites and submit same to BOG by 31st March of the ensuing year.

65. To improve comparability across banks' disclosed levels of IRRBB, exposures should be calculated on the following basis:

a) Change in Economic Value of Equity (ΔEVE)

i. Banks should exclude their own equity from the computation of the exposure level.

ii. Banks should include all cash flows from all interest rate-sensitive assets[18], liabilities and off-balance sheet items in the banking book in the computation of their exposure. Banks should disclose whether they have excluded or included commercial margins and other spread components in their cash flows.

iii. Cash flows should be discounted using either a risk-free rate[19] or a risk-free rate including commercial margins and other spread components (only if the bank has included commercial margins and other spread

[18] Interest rate-sensitive assets are assets which are not deducted from Common Equity Tier 1 (CET1) capital, and which exclude (i) fixed assets such as real estate or intangible assets as well as (ii) equity exposures in the banking book.
[19] The discounting factors must be representative of a risk-free zero-coupon rate. An example of an acceptable yield curve is a secured interest rate swap curve.

components in its cash flows). Banks should disclose whether they have discounted their cash flows using a risk-free rate (prevailing Government of Ghana instrument rate for the specific time bucket) or a risk-free rate including commercial margins and other spread components.

iv. The change in economic value of equity (ΔEVE) should be computed assuming a run-off balance sheet, where existing banking book positions are amortised and are not replaced by any new business.

b) Change in net interest income (ΔNII)

i. Banks should include expected cash flows (including commercial margins and other spread components) from all interest rate-sensitive assets, liabilities and off-balance sheet items in the banking book.

ii. ΔNII should be computed assuming a constant balance sheet, where maturing or repricing cash flows are replaced by new cash flows with identical features with regard to the amount, repricing period and spread components.

iii. ΔNII should be disclosed as the difference in future interest income over a rolling 12-month period.

PART IV – SUPERVISORY EXPECTATION ON IRRBB

Overview of Supervisory Assessment

66. RFIs should identify and assess the IRRBB inherent in all their products and activities and ensure that these are subject to adequate procedures and effective controls.

67. Any significant hedging or risk management initiatives must be appropriately approved prior to implementation. New products and activities should undergo a thorough assessment to ensure that the IRRBB characteristics are fully understood and subject to a defined test (pilot) phase before being fully rolled out. Before introducing any new product, hedging or risk-taking strategy, RFIs should establish adequate operational procedures and risk control systems.

68. As part of its Supervisory Review Process (SRP), BOG will evaluate the adequacy of RFIs' methodologies and internal processes, including the assumptions used in assessing and measuring IRRBB.

Appendix I: The Standardised Framework (SF)

Overall Structure of the Standardised Framework

1. The BOG requires banks to apply the Standardised Methodology (SM) in the computation of IRRBB. However, banks which meet the specified conditions in **PART IV** may choose to apply IMS. The SM has been adopted from the BCBS Standardised Framework. The steps involved in measuring a bank's IRRBB, under the SM, based solely on Economic Value of Equity (EVE) are:

Stage 1. Categorisation of Positions

2. Banking book positions sensitive to interest rate changes are allocated to one of three categories:

   a) Amenable to standardisation
   b) Less amenable to standardisation
   c) Not amenable to standardisation

Stage 2. Determination of slotting of cash flows based on repricing maturities.

3. This is a straightforward translation for positions amenable to standardisation. Positions less amenable to standardisation should be excluded from this step. For positions with embedded automatic interest rate options, the optionality should be ignored for the purpose of slotting of notional repricing cash flows[19].

4. For positions that are not amenable to standardisation, there is a separate treatment for:

   a) *NMDs* – according to separation of core and non-core cash flows via the approach set out in **paragraphs 15 to 19 below.**

   b) *Behavioural options* (fixed rate loans subject to prepayment risk and term deposits subject to early redemption risk) – behavioural parameters relevant to the position type must rely on a **scenario-dependent look-up table** set out **in paragraphs 28 and 33 below**.

Stage 3. Determination of ΔEVE for relevant interest rate shock scenarios for each currency.

5. The ΔEVE is measured per currency for all prescribed and suggested additional interest rate shock scenarios (*refer to Appendix II and III*).

[19] The embedded automatic interest rate option is stripped out from the process of slotting notional repricing cash flows in Stage 2 and treated together with other automatic interest rate options under Stage 4

Stage 4. Add-ons for changes in the value of automatic interest rate options (whether explicit or embedded) are added to the EVE changes.

6. Automatic interest rate options sold are subject to full revaluation (possibly net of automatic interest rate options bought to hedge sold interest rate options) under each of the prescribed and, where applicable, the suggested additional interest rate shock scenarios for each currency. Changes in values of options are then added to the changes in the EVE measure under each interest rate shock scenario on a per currency basis.

Stage 5. IRRBB EVE calculation.

7. The ΔEVE under the standardised framework for supervisory purposes will be the maximum of the worst aggregated reductions to EVE across the supervisory prescribed interest rate shocks (Appendix I).

Components of the standardised framework

Cash flow bucketing

8. Banks must project all future notional repricing cash flows arising from interest rate-sensitive assets[20], liabilities[21] and off-balance sheet items onto:

   a) nineteen (19) predefined time buckets (indexed numerically by k) as set out in Table 1 below, into which they fall according to their repricing dates; or

   b) the time bucket midpoints as set out in Table 1, retaining the notional repricing cash flows' maturity. Alternatively, "a)" requires splitting up notional repricing cash flows between two adjacent maturity bucket midpoints.

9. The table below includes the time buckets and the time bucket midpoints to which the cash flows are allocated for each currency.

10. A notional repricing cash flow CF(k) is defined as:

    a) any repayment of principal (e.g., at contractual maturity);

    b) any repricing of principal; repricing is said to occur at the earliest date at which either the bank or its counterparty is entitled to unilaterally change the interest rate, or at which the rate on a floating rate instrument changes automatically in response to a change in an external benchmark; or

[20] which are not deducted from Common Equity Tier 1 (CET1) capital, and which exclude:
i. Property, Plant and Equipment (PPE) and intangible assets; and
ii. equity exposures in the banking book;

[21] including all non-remunerated deposits), other than CET1 capital under the Basel III framework

c) any interest payment on a tranche of principal that has not yet been repaid or repriced; spread components of interest payments on a tranche of principal that has not yet been repaid and which do not reprice must be slotted until their contractual maturity irrespective of whether the non-amortised principal has been repriced or not. The date of each repayment, repricing or interest payment is referred to as its repricing date.

11. Floating rate instruments are assumed to reprice fully at the first reset date. Hence, the entire principal amount is slotted into the bucket in which that date falls, with no additional slotting of notional repricing cash flows to later time buckets or time bucket midpoints (other than the spread component which is not repriced).

Table 1: Time Buckets and Time Bucket Midpoints

The maturity schedule with 19-time buckets for notional repricing cash flows repricing at t^{CF} The number in brackets is the time bucket's midpoint								
Time bucket intervals (M: months; Y: years)								
Short-term rates	Overnight (0.0028Y)	$\frac{0}{N} < t^{CF} \leq 1M$ (0.0417Y)	$1M < t^{CF} \leq 3M$ (0.1667Y)	$3M < t^{CF} \leq 6M$ (0.375Y)	$6M < t^{CF} \leq 9M$ (0.625Y)	$9M < t^{CF} \leq 1Y$ (0.875Y)	$1Y < t^{CF} \leq 1.5Y$ (1.25Y)	$1.5Y < t^{CF} \leq 2Y$ (1.75Y)
Medium-term rates	$2Y < t^{CF} \leq 3Y$ (2.5Y)	$3Y < t^{CF} \leq 4Y$ (3.5Y)	$4Y < t^{CF} \leq 5Y$ (4.5Y)	$5Y < t^{CF} \leq 6Y$ (5.5Y)	$6Y < t^{CF} \leq 7Y$ (6.5Y)			
Long-term rates	$7Y < t^{CF} \leq 8Y$ (7.5Y)	$8Y < t^{CF} \leq 9Y$ (8.5Y)	$9Y < t^{CF} \leq 10Y$ (9.5Y)	$10Y < t^{CF} \leq 15Y$ (12.5Y)	$15Y < t^{CF} \leq 20Y$ (17.5Y)	$t^{CF} > 20Y$ (25Y)		

Process for Slotting and Decomposing Banking Book Instruments

12. All notional repricing cash flows associated with interest rate-sensitive assets, liabilities and off-balance sheet items, for each currency, are allocated to the prescribed time buckets or time bucket midpoints (henceforth, denoted by $CF_{i,c}(k)$ or $CF_{i,c}(t_k)$) under interest rate shock scenario i and currency c based on their amenability to standardisation

Process for positions that are amenable to standardisation

13. Notional repricing cash flows can be slotted into appropriate time buckets or time bucket midpoints based on their contractual maturity, if subject to fixed coupons, or into the next repricing period if coupons are floating. Positions amenable to standardisation fall into two categories:

a) *Fixed rate positions:* such positions generate cash flows that are certain till the point of contractual maturity. Examples are fixed rate loans without embedded prepayment options, term deposits without

redemption risk and other amortising products such as mortgage loans. All coupon cash flows, and periodic or final principal repayments should be allocated to the time bucket midpoints closest to the contractual maturity.

b) *Floating rate positions*: such positions generate cash flows that are not predictable past the next repricing date other than that the present value would be reset to par. Accordingly, such instruments can be treated as a series of coupon payments until the next repricing and a par notional cash flow at the time bucket midpoint closest to the next reset date bucket.

14. Positions amenable to standardisation include those with embedded automatic interest rate options where the optionality (whether sold or bought) should be ignored for the purpose of slotting of notional repricing cash flows. That is, the stripped-out embedded automatic interest rate option must be treated together with explicit automatic interest rate options.

Process for positions not amenable to standardisation[22]

15. Positions not amenable to standardisation include NMDs, fixed rate loans subject to prepayment risk and term deposits subject to early redemption risk.

Treatment of NMDs

16. Under the standardised framework, banks should first separate their NMDs according to the nature of the deposit and depositor. Banks should then identify, for each category, the core and non-core deposits, up to the limits specified in **Table 2**. Finally, banks should determine an appropriate cash flow slotting for each category, in accordance with the average maturity limits specified in **Table 2**.

NMD categories

17. NMDs must be segmented into retail and wholesale categories. Retail deposits are defined as deposits placed with a bank by an individual person. Deposits made by Micro, Small and Medium-Sized Enterprise (MSME) customers and managed as retail exposures are considered as having similar interest rate risk characteristics to retail accounts and thus can be treated as retail deposits. Retail deposits should be considered as held in a transactional account when regular transactions are carried out in that account (e.g., when salaries are regularly credited) or when the deposit is non-interest bearing. Other retail deposits should be considered

[22] A common feature of these positions is *optionality* that makes the timing of notional repricing cash flows uncertain. This optionality introduces a non-linearity, which suggests that delta-equivalent approximations are imprecise for large interest rate shock scenarios.

as held in a non-transactional account. Deposits from legal entities, sole proprietorships or partnerships are captured in wholesale deposit categories.

Separation of NMDs

18. Banks should distinguish between the stable and the non-stable parts of each NMD category using observed volume changes over the past 10 years. Where a bank does not have 10 years of data then a shorter historical period may be used. The bank should however put in place measures aimed at building the data history over time. The stable NMD portion is the portion that is found to remain undrawn with a high degree of likelihood. Core deposits are the proportion of stable NMDs which are unlikely to reprice even under significant changes in the interest rate environment[23]. The remainder constitutes non-core NMDs.

19. Banks are required to estimate their level of core deposits using this two-step procedure for each deposit category, and then to aggregate the results to determine the overall volume of core deposits subject to imposed caps as shown in **Table 2**.

Cash flow slotting

20. NMDs should finally be slotted into the appropriate time bucket or time bucket midpoint. Non-core deposits should be considered as overnight deposits and accordingly should be placed into the shortest/overnight time bucket or time bucket midpoint.

21. Banks should determine an appropriate cash flow slotting procedure for each category of core deposits, up to the maximum average maturity per category as specified in **Table 2** below.

Table 2: Caps on Core Deposits and Average Maturity by Category

	Cap on proportion of core deposits to total NMDs (%)	Cap on average maturity of core deposits (years)
Retail/transactional	90	5
Retail/non-transactional	70	4.5
Non-retail	50	4

[23] Banks are expected to identify and assess all their material risk which may include credit risk spread in the banking book

Treatment of positions with behavioural options other than NMDs

22. The treatment set out in this section applies only to behavioural options related to retail customers. Where a wholesale customer has a behavioural option that may change the pattern of notional repricing cash flows, such options must be included within the category of automatic interest rate options.

Standardised framework for positions with behavioural options other than NMDs

23. The standardised framework is applied to fixed rate loans subject to prepayments and term deposits subject to early redemption risk. In each case, the customer has an option, which, if exercised, will alter the timing of an RFI's cash flows. The customer's exercise of the option is, among other factors, influenced by changes in interest rates. In the case of the fixed rate loan, the customer has an option to repay the loan early (i.e., prepay); and for a fixed-term deposit, the customer may have an optional to withdraw their deposit before the scheduled date.

24. Under the standardised framework, the optionality in these products are estimated using a two-step approach:

    a. Firstly, baseline estimates of loan prepayments and early withdrawal of fixed-term deposits are calculated given the prevailing term structure of interest rates; and

    b. In the second stage, the baseline estimates are multiplied by scenario-dependent scalars that reflect the likely behavioural changes in the exercise of the options.

Fixed rate loans subject to prepayment risk

25. Prepayments, or parts thereof, for which the economic cost is not charged to the borrower, are referred to as uncompensated prepayments. For loan products where the economic cost of prepayments is never charged, or charged only for prepayments above a certain threshold, the standardised framework for fixed rate loans subject to prepayments set out below must be used to assign notional repricing cash flows.

26. Banks should develop and validate the baseline conditional prepayment rate ($CPR_{0,c}^{p}$) for each portfolio p of homogeneous prepayment-exposed loan products denominated in currency c, under the prevailing term structure of interest rates. The BOG may, on a case-by-case basis, challenge the bank's assumptions or impose conservative floors.

27. The conditional prepayment rate (CPR) for each portfolio p of homogeneous prepayment-exposed loan products denominated in currency c, under interest rate scenario i, is given as:

$$(CPR_{i,c}^{P}) = \min(1, \gamma_i \cdot (CPR_{0,c}^{P})$$

where $(CPR_{0,c}^{P})$ the (constant) baseline CPR of a portfolio *p* of homogeneous prepayment-exposed loans given in currency c and given the prevailing term structure of interest rates. γ_i is a multiplier for scenario i as given in **Table 3**.

28. Prepayment speeds vary according to the interest rate shock scenario. The multipliers ($\boldsymbol{\gamma_i}$) reflect the expectation that prepayments will generally be higher during periods of falling interest rates and lower during periods of rising interest rates.

Table 3: CPRs under the Shock Scenarios

	Scenario number (i)	Interest rate shock scenarios	γ_i (scenario multiplier)
Prescribed CPRs *under the Shock Scenarios* interest rate shock scenarios	1	Parallel up	0.8
	2	Parallel down	1.2
Suggested additional interest rate shock scenarios	3	Steepener	0.8
	4	Flattener	1.2
	5	Short rate up	0.8
	6	Short rate down	1.2

29. The prepayments on the fixed rate loans must ultimately be reflected in the relevant cash flows (scheduled payments on the loans, prepayments and interest payments). These payments can be broken up into scheduled payments adjusted for prepayment and uncompensated prepayments[24]:

$$CF_{i,c}^{P}(k) = CF_{i,c}^{S}(k) + CPR_{i,c}^{P} \cdot N_{i,c}^{P}(k-1)$$

where $CF_{i,c}^{S}(k)$ refers to the scheduled interest payment and principal repayment, and $N_{i,c}^{P}(k-1)$ denotes the notional outstanding at the time bucket *k- 1*. The base cash flows (i.e., given the current interest rate yield curve and the base CPR) are given by *i=0*, while the interest rate shock scenarios are given for i=1 to 2 (or 6 where the bank has opted to take into account all the six interest rate scenarios).

Term deposits subject to early redemption risk

[24] For simplicity, it has been assumed that there is no annual limit on prepayments. However, if a bank has an annual limit on uncompensated prepayments, this limit will apply.

30. Term deposits lock in a fixed rate for a fixed term and would usually be hedged on that basis. However, term deposits may be subject to the risk of early withdrawal, also called early redemption risk. Consequently, term deposits may only be treated as fixed rate liabilities and their notional repricing cash flows slotted into the time buckets or time bucket midpoints up to their corresponding contractual maturity dates, provided that:

    a) the depositor has no legal right to withdraw the deposit; or

    b) an early withdrawal results in a significant penalty that at least compensates for the loss of interest between the date of withdrawal and the contractual maturity date and the economic cost of breaking the contract.

31. If neither of these conditions are met, the depositor holds an option to withdraw, and the term deposits are deemed to be subject to early redemption risk. Further, if a bank issues term deposits that do not meet the above criteria to wholesale customers, it must assume that the customer will always exercise the right to withdraw in the way that is most disadvantageous to the bank (i.e., the deposit is classified as an automatic interest rate option).

32. Banks should determine and validate the baseline term deposit redemption ratio $TDRR^{P}_{0,c}$ applicable to each homogeneous portfolio p of term deposits in currency c and use it to slot the notional repricing cash flows. Term deposits which are expected to be redeemed early are slotted into the overnight time bucket (k=1) or time bucket midpoint (t_1). The BOG may, on a case-by-case basis, challenge the bank's assumptions or impose conservative floors.

33. The term deposit redemption ratio for time bucket k or time bucket midpoint t_k applicable to each homogeneous portfolio p of term deposits in currency c and under scenario i is obtained by multiplying $TDRR^{P}_{0,c}$ by a scalar u_i that depends on the scenario i, as follows:

$$TDRR^{P}_{i,c} = min(1, u_i \cdot TDRR^{P}_{0,c})$$

where the values of the scalars u_i are set out in Table 4

Table 4: TDRR scalars under the shock scenarios

	Scenario number (i)	Interest rate shock scenarios	u_i (Scenario multiplier)
Prescribed interest rate shock scenarios	1	Parallel up	1.2
	2	Parallel down	0.8
	3	Steepener	0.8
	4	Flattener	1.2

Suggested additional interest rate shock scenarios	5	Short rate up	1.2
	6	Short rate down	0.8

34. The notional repricing cash flows which are expected to be withdrawn early under any interest rate shock scenario i are described as:

$$CF_{i,c}^{p}(1) = TD_{0,c}^{p} \cdot TDRR_{i,c}^{p}$$

where $TD_{0,c}^{p}$ is the outstanding amount of term deposits of type *p*.

Process for positions that are less amenable to standardisation (automatic interest rate options)

35. This section describes the methodology for calculating an add-on explicit automatic interest rate option, as well as embedded automatic interest rate options that are separated or stripped out from the bank's assets or liabilities i.e., the host contract. Banks have a choice to either include all purchased automatic options or include only automatic options used for hedging sold automatic interest rate options:

a) For each sold automatic option **o** in currency **c**, the value change, denoted $\Delta FVAO_{i,c}^{o}$ is calculated for each interest rate shock scenario *i*. The value change is given by:

i) an estimate of the value of the option to the option holder, given
- a yield curve in currency c under the interest rate shock scenario i; and
- a relative increase in the implicit volatility of 25%;

minus

ii) the value of the sold option to the option holder, given the yield curve in currency c at the valuation date.

b) Likewise, for each purchased automatic interest rate option *q*, the bank must determine the change in value of the option between interest rate shock scenario *i* and the current interest rate term structure combined with a relative increase in the implicit volatility of 25%. This is denoted as $\Delta FVAO_{i,c}^{q}$

c) The add-on under the scenario i and in currency c is calculated as the sum of the changes for all sold options minus the sum of the value changes for all purchased options:

$$KAO_{i,c} = \sum_{o=1}^{n_c} \Delta FVAO_{i,c}^{o} - \sum_{q=1}^{m_c} \Delta FVAO_{i,c}^{q}$$

where $\boldsymbol{n_c}$ ($\boldsymbol{m_c}$) is the number of sold (purchased) options in currency c.

36. If the bank chooses to only include bought automatic interest rate options that are used for hedging sold automatic interest rate options, the bank must, for the remaining purchased options, add any changes in market values reflected in the regulatory capital measure of the respective capital ratios (i.e., CET1, AT1 or total capital) in alignment with BOG's Capital Requirement Directive (CRD), to the total automatic interest rate option risk measure $KAO_{i,c}$

Calculation of the standardised EVE risk measure

37. First, the change in economic value of equity $\Delta EVE_{i,c}$ under scenario i and currency c is calculated for each currency with material exposures, i.e., those accounting for more than 5% of either banking book assets or liabilities, as follows:

a) Under each scenario i, all notional repricing cash flows are slotted into the respective time bucket $k \in \{1,2,\cdots,K\}$ or time bucket midpoint $t_k \in \{1,2,\cdots,K\}$. Within a given time bucket k or time bucket midpoint t_k, all positive and negative notional repricing cash flows are netted to form a single long or short position, with the cancelled parts removed from the calculation. Following this process across all time buckets or time bucket midpoints leads to a set of notional repricing cash flows $CF_{i,c}(k)$ or $CF_{i,c}(t_k)$ $\kappa \in \{1, 2,\ldots,K\}$.

b) Net notional repricing cash flows in each time bucket k or time bucket midpoint t_k, are weighted by a continuously compounded discount factor:

$$DF_{i,c}(t_k) = \exp\left(-R_{i,c}(t_k) \cdot t_k\right)$$

(Note: $DF = (1+r)^{-t}$ and the continuously compounded is $DF = \exp(-r.t)$)

that reflects the interest rate shock scenario *i* in currency c as set out in **Appendix II** and **Appendix III** and where $\boldsymbol{t_k}$ is the midpoint of time bucket k. This result is a weighted net position, which may be positive or negative for each time bucket. The cash flows should be discounted using either a risk-free rate or a risk-free rate including commercial margin and other spread components (only if the bank has included commercial margins and other spread components in its cash flows).

c) These risk-weighted net positions are summed to determine the EVE in currency c under scenario i (excluding automatic interest rate option positions):

$$EVE_{i,c}^{nao} = \sum_{k=1}^{K} CF_{i,c}\,(k) \cdot DF_{i,c}(t_k)\ (maturity\ buckets)\ or$$

$$EVE_{i,c}^{nao} = \sum_{k=1}^{K} CF_{i,c}\,(t_k) \cdot DF_{i,c}(t_k)\ (maturity\ bucket\ midpoints)$$

d) Then, the full change in EVE in currency c associated with scenario i is obtained by subtracting $EVE_{i,c}^{nao}$ from the EVE under the current interest rate term structure $EVE_{0,c}^{nao}$ and by adding the total measure for automatic interest rate option risk $KAO_{i,c}$ as follows:

- For maturity buckets:

$$\Delta EVE_{i,c} = \sum_{k=1}^{K} CF_{o,c}\,(k) \cdot DF_{0,c}(t_k) - \sum_{k=1}^{K} CF_{i,c}\,(k) \cdot DF_{i,c}(t_k) + KAO_{i,c}$$

- or, for maturity buckets midpoints:

$$\Delta EVE_{i,c} = \sum_{k=1}^{K} CF_{o,c}\,(t_k) \cdot DF_{0,c}(t_k) - \sum_{k=1}^{K} CF_{i,c}\,(t_k) \cdot DF_{i,c}(t_k) + KAO_{i,c}$$

38. Finally, the EVE losses $\boldsymbol{\Delta EVE_{i,c}}$ are aggregated under a given interest rate shock scenario i and the maximum loss across all interest rate shock scenarios is the EVE risk measure:

$$Standardised\ EVE\ Risk\ Measure = \max_{i \in \{1,2,\cdots,6\}} \left\{ max\left(0; \sum_{c:\Delta EVE_{i,c}>0} \Delta EVE_{i,c}\right)\right\}$$

Appendix II: Standardised Interest Rate Risk Shock Scenarios

1. Banks shall apply two mandatory interest rate shock scenarios (Table 1 below) to capture parallel gap risks for EVE and for NII. These scenarios should be applied to IRRBB exposures in each currency for which banks have material positions. In order to accommodate heterogeneous economic environments across jurisdictions, the shock scenarios in **Table 5** below reflect currency specific absolute shocks. Under this approach, IRRBB should be measured by means of two scenarios reflecting **parallel up and down shock** for quarterly supervisory reporting and annual ICAAP submission to BOG as well as Pillar 3 disclosures.

Table 5: Specified size of interest rate shocks[25]

	Specified size of interest rate shocks					
	GHS	USD	EUR	GBP	CNY	Other
Parallel shift in basis points (bps)	450	200	225	275	225	325

2. Banks may also consider the additional interest rate shock scenarios specified in **Appendix III** aimed at capturing non-parallel gap risk.

3. Given Table 1 above, the instantaneous shocks to the risk-free rate for parallel shock scenario for each currency, the following parameterisations of the two interest rate shock scenarios (parallel shock up and parallel shock down) should be applied:

   Parallel shock for currency c: a constant parallel shock up or down across all time buckets.

$$\Delta S_{parallel,c}(t_k) = \pm \bar{S}_{parallel,c}$$

[25] The interest rate shock for GHS is informed by historical changes in GHS and other comparable emerging currencies interest rate.

Appendix III: Additional Interest Rate Risk Shock Scenarios

1 Banks may also consider the following four additional interest rate shock scenarios to capture non-parallel gap risks for EVE. Similar to the standardised scenarios in **Appendix II**, these scenarios should be applied to IRRBB exposures in each currency for which banks have material positions. To accommodate heterogeneous economic environments across jurisdictions, the scenarios in the Table below reflect currency specific absolute shocks.

a) steepener shock (short rates down and long rates up);

b) flattener shock (short rates up and long rates down);

c) short rates shock up; and

d) short rates shock down

Table 6: Specified size of interest rate shocks (Additional Shock Scenarios)

	Specified size of interest rate shocks					
	GHS	USD	EUR	GBP	CNY	Other
Short	500	300	350	425	300	500
Long	300	225	200	250	150	300

2 Similar to the approach for standardised scenarios specified in Appendix II and taking into account the interest rate shock in **Table 6** above, the instantaneous

3

4 parameterisations of interest rate shock scenarios should be applied:

(i) *Short rate shock for currency c:* shock up or down that is greatest at the shortest tenor midpoint. That shock, through the shaping scalar $\alpha_{short}(t_k) = \left(e^{\frac{-t_k}{x}}\right)$, where $x = 4$, diminishes towards zero at the tenor of the longest point in the term structure.[23], [24]

$$\Delta S_{short,c}(t_k) = \pm \bar{S}_{short,c} \cdot \alpha_{short}(t_k) = \pm \bar{S}_{short,c} \cdot e^{\frac{-t_k}{x}}$$

(ii) *Long rate shock for currency c (note: this is used only in the rotational shocks):* Here the shock is greatest at the longest tenor midpoint and is related to the short scaling factor as $\alpha_{long}(t_k) = 1 - \alpha_{short}(t_k)$

[23] The value of x in the denominator of the function $e^{\frac{-t_k}{x}}$ controls the rate of decay of the shock. This should be set to the value of 4 for most currencies and the related shocks unless otherwise determined by national supervisors.

[24] t_k is the midpoint (in time) of the k^{th} bucket and t_K is the midpoint (in time) of the last bucket K. There are 19 buckets in the standardised framework.

$$\Delta S_{\text{long,c}}(t_k) = \pm\bar{S}_{\text{long,c}} \cdot \alpha_{\text{long}}(t_k) = \pm\bar{S}_{\text{long,c}} \cdot \left(1 - e^{\frac{-t_k}{x}}\right)$$

(iii) *Rotation shocks for currency c:* involving rotations to the term structure (i.e., steepeners and flatteners) of the interest rates whereby both the long and short rates are shocked and the shift in interest rates at each tenor midpoint is obtained by applying the following formulas to those shocks:

$$\Delta S_{steepener,c}(t_k) = -0.65 \cdot \left|\Delta S_{short,c}(t_k)\right| + 0.9 \cdot \left|\Delta S_{long,c}(t_k)\right|$$
$$\Delta S_{flattener\ ,c}(t_k) = +0.8 \cdot \left|\Delta S_{short,c}(t_k)\right| - 0.6 \cdot \left|\Delta S(t_k)\right|$$

Appendix IV: Disclosures

Table 7: Qualitative Disclosures

Purpose: To provide a description of the risk management objectives and policies concerning IRRBB.	
Scope of application: Mandatory for all banks	
Frequency: Annual, as at the bank's financial year-end.	
Format: Flexible	
Qualitative disclosure	
a	A description of how the bank defines IRRBB for purposes of risk control and measurement
b	A description of the bank's overall IRRBB management and mitigation strategies. Examples are: monitoring of EVE and NII in relation to established limits, hedging practices, conduct of stress testing, outcomes analysis, the role of independent audit, the role and practices of the ALCO, and timely updates in response to changing market conditions
c	The frequency of the calculation of the bank's IRRBB measures, and a description of the specific measures that the bank uses to assess its sensitivity to IRRBB
d	A description of the interest rate shock and stress scenarios that the bank uses to estimate changes in the economic value and earnings
e	A high-level description of how the bank hedges its IRRBB, as well as the associated accounting treatment
f	A high-level description of key modelling assumptions used in calculating ΔEVE and ΔNII in Table B below
g	Any other information which the bank wishes to disclose regarding its interpretation of the significance and sensitivity of the IRRBB measures disclosed and/or an explanation of any significant variations in the level of the reported IRRBB since previous disclosures
Quantitative disclosures	
1	Average repricing maturity assigned to NMDs
2	Longest repricing maturity assigned to NMDs

Table 8: Quantitative Disclosures

Scope of application: Mandatory for all banks

Content: Quantitative information

Frequency: Annual, as at the bank's financial year-end.

Format: Fixed

Accompanying narrative: Commentary on the significance of the reported values and an explanation of any material changes since the previous reporting period.

In reporting currency	**ΔEVE**		**ΔNII**	
Period	**T**	**T-1**	**T**	**T-1**
Parallel up				
Parallel down				
Maximum				
Period	**T**		**T-1**	
Tier 1 Capital				

Definitions

For each of the BOG prescribed interest rate shock scenarios (Appendix II), banks must report for the current period and for the previous period:

(i) the change in the economic value of equity based on the result of the standardised framework as set out in Appendix I and

(ii) the change in projected NII over a forward-looking rolling 12-month period compared with the bank's own best estimate 12-month projections, using a constant balance sheet assumption and an instantaneous shock.