# CENTRAL BANK OF NIGERIA

# GUIDELINES ON THE MANAGEMENT OF INTEREST RATE RISK IN THE BANKING BOOK (IRRBB)

**Issue Date: March 2019**

**Effective Date: January 2020**

# Table of Content

# 1. Abbreviations

| Acronym | Description |
|---|---|
| ALCO | Asset and Liability Management Committee |
| BCBS | Basel Committee on Banking Supervision |
| CBN | Central Bank of Nigeria |
| CPR | Conditional Repayment Rate |
| CSRBB | Credit Spread Risk in the Banking Book |
| EaR | Earnings at Risk |
| EV | Economic Value |
| EVE | Equity Value of Equity |
| GDP | Gross Domestic Product |
| ICAAP | Internal Capital Adequacy Assessment Process |
| IMS | Internal Measurement System |
| IRRBB | Interest Rate Risk in the Banking Book |
| LTV | Loan-to-Value |
| NII | Net Interest Income |
| NMDs | Non-Maturity Deposits |
| PV | Present Value |
| PVO1 | Price Value of 1 basis point |
| RAF | Risk Appetite Framework |
| RAS | Risk Appetite Statement |
| SM | Standardised Measurement |
| TDRR | Term Deposit Redemption Rate |

## 2. Introduction

1. This Guidance Note sets out the Central Bank of Nigeria (CBN) specified principles and methods expected to be adopted by banks operating in Nigeria for measuring, managing, monitoring and controlling Interest Rate Risk in the Banking Book (IRRBB), as part of their Internal Capital Adequacy Assessment Process (ICAAP). The Guidance Note is consistent with the standards on IRRBB as published in April 2016 by the Basel Committee on Banking Supervision (BCBS).

2. IRRBB refers to the current or prospective risk to both earnings and economic value of a bank arising from adverse movements in interest rates that affect interest rate sensitive positions in the banking book.

3. The banking book refers to instruments not in the trading book. In January 2016, the Basel Committee on Banking Supervision (BCBS) issued a standard document on minimum capital requirements for market risk that defines a trading book as one comprising instruments 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 risks that arise from the above.

4. IRRBB can arise from a variety of sources and financial transactions and has a number of components including: gap risk, basis risk and option risk.

5. Gap risk results from the term structure of interest sensitive banking book exposures that arises from differences in the timing of changes in rates. Basis risk results from the impact of relative changes in interest rates on interest sensitive positions that have similar tenor but which are repriced using different interest rate indices. Option risk, on the other hand, arises from embedded or explicit options, where the bank or its customer can alter the level or timing of their cash flows.

6. Excessive IRRBB can pose a significant threat to a bank's capital position and future earnings if not well-managed. The expectation is that when interest rates change, the Present Value (PV) and timing of future cash flows also change. This in turn changes the underlying value of a bank's assets, liabilities and off-balance sheet items and hence its Economic Value (EV). Changes in interest rates also affect a bank's earnings by altering interest rate-sensitive income and expenses, affecting its Net Interest Income (NII).

7. The expectation is that this Guideline will come into full effect in **January 2020**. The CBN however encourages early adoption of the expectation set out in the Guideline to ensure alignment of banks practices with international best practice.

## 3. Scope of Application

### 3.1 Reporting Level

8. This Guidance Note focuses only on interest rate risk with respect to the banking book exposures as interest rate risk arising from trading book exposures is covered under the Pillar 1 market risk regulations. It outlines the supervisory expectations in relation to IRRBB management framework, and the specific systems to be implemented by a bank for the identification, measurement and management of IRRBB. It also spells out the supervisory requirements in relation to the bank's internal governance and control arrangements for the management of IRRBB.

9. The Guidance Note applies to all commercial and merchant banks operating in Nigeria. Banks are therefore required to, on an annual basis, render their IRRBB reports as part of Pillar 2 reporting at the same entity level at which the Internal Capital Adequacy Assessment Process (ICAAP) report is made. In addition, the IRRBB report should cover every major currency in which a bank holds interest rate-sensitive positions (e.g. Naira, US Dollars, Euro, British Pound, Renminbi, etc.), which is defined, for the purpose of this Guidance Note, as each currency with material exposures, i.e. those accounting for more than 5% of the bank's either banking book assets or liabilities.

## 3.2 Reporting Standards

10. Banks are required to adopt the Standardised Methodology (SM) for the assessment of IRRBB, for supervisory reporting (ICAAP), as outlined under **Section 6** (The CBN Standardised Framework) and **Appendix 4** (The Standardized Methodology). 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:

i) The bank has appropriate model governance framework incorporating:

a) A formal model management policy appropriately approved by the board;

b) Specification of management roles and personnel responsible for the development, validation, documentation, implementation and use of models for quantification of IRRBB;

c) A regular formal process for the assessment of model risk;

d) A regular independent model review and validation. The validation process should particularly include evaluation of: conceptual and methodological soundness; model monitoring, including process verification and benchmarking; analysis of outcomes and back-testing; and assessment of any expert opinions and judgments used in internal models

ii) Interest rate risk is reported on a regular basis to the board and management on the basis of the bank's IMS and assumptions;

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

iv) The IMS data should allow the management of interest rate to be scrutinized and monitored sufficiently;

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

a) Projected net interest income in the first and second year after the reporting date under the baseline interest rate scenario

b) The level of the bank's Own Funds under the baseline interest rate scenario

c) 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

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

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

f) Regulatory capital to cover IRRBB

## 4. Supervisory Expectations

11. Banks are required to have a comprehensive risk management process in place that effectively identifies, measures, monitors and controls IRRBB exposures. The process should also be subjected to appropriate board and senior management oversight. The Principles outlined in this Guidance Note, when properly embedded, will ensure a successful implementation of a comprehensive and efficient risk management process for IRRBB management. These prescribed principles will be used by the CBN as supervisory criteria in the evaluation of banks' interest rate risk management processes and procedures.

12. Below is a specification of the CBN's supervisory expectations in relation to a banks' frameworks, processes and practices for management of IRRBB. The CBN's expectations are generally consistent with BCBS principles.

## 4.1 IRRBB Elements

13. Banks are expected to be familiar with all elements of IRRBB and, on a continuous basis, identify, monitor, measure and control their exposures to IRRBB. In addition, they are expected to identify the IRRBB inherent in their products and activities, and ensure that these are subject to adequate management procedures and controls. Credit Spread Risk in the Banking Book (CSRBB), where significant, should also be properly monitored and assessed.

## 4.2 Board Oversight

14. A bank's board is responsible for the oversight of the IRRBB management framework and the bank's risk appetite for IRRBB. Specifically, supervisory expectations with regards to a bank's board include:

a) Ensuring implementation of an adequate IRRBB management framework, incorporating clear guidance on the acceptable level of IRRBB;

b) Ensuring that steps are taken by the bank to identify, measure, monitor and control IRRBB in line with the approved framework;

c) Overseeing the review of IRRBB management policies, procedures and limits. The board should be informed regularly (at least semiannually) on the level of and trend in the bank's IRRBB exposures by any committee(s) to which certain IRRBB responsibilities have been delegated;

d) Ensuring that board members understand the implications and impact of the bank's IRRBB exposures and strategies in relation to market, liquidity, credit and operational risk. Board members

should also have sufficient technical knowledge to effectively challenge IRRBB reports;

e) Clearly identify committee(s) with delegated authority for managing IRRBB and ensure committee(s) meet regularly and include representatives from each major department connected to IRRBB management;

f) Ensure that the IRRBB identification, measurement, monitoring and control processes are regularly reviewed by an independent audit function (such as an internal or external auditors).

### 4.3 Risk Appetite

15. Banks should have an approved and clear Risk Appetite Statement (RAS) for the IRRBB, and this should be articulated in terms of the risk to both Economic Value of Equity (EVE) and earnings. It is expected that risk appetite for the IRRBB will be implemented through the bank's corporate Risk Appetite Framework (RAF).

16. The approach used by banks to track their risk appetite including the applicable limits will be subject to the CBN's supervisory review and evaluation.

### 4.4 Measurement of IRRBB Using IMS

17. Banks that qualify to adopt an IMS are expected to implement an appropriate system that measures their IRRBB based on both economic value and earnings-based methodologies. The bank's IMS for IRRBB should specifically incorporate the calculation of the impact of multiple scenarios on economic value and earnings, based on:

a) internally formulated interest rate shock scenarios which takes into account the bank's specific IRRBB risk profile, as per its ICAAP;

b) historical and hypothetical interest rate stress scenarios, which should ideally be more severe than the six (6) supervisory prescribed standard shock scenarios;

c) the six (6) prescribed interest rate shock scenarios set out in **Appendix 3**; and

d) any additional interest rate shock scenarios which may be prescribed by the CBN.

### 4.5 Assumptions

18. In measuring IRRBB, banks should ensure that their key behavioural and modelling assumptions underlying their measurement system are fully understood, conceptually sound, consistent with historical experience, and well documented.

19. Banks should, in particular, make sound and reasonable judgments and assumptions about how an instrument's actual maturity or repricing behaviour may vary from the instrument's contractual terms because of behavioural optionalities. Generally, assumptions may be made in relation to:

a) expectations 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 non-maturity deposits (NMDs);

c) treatment of own equity in economic value measures; and

d) the implications of accounting practices for IRRBB.

20. Banks should carefully consider how the exercise of behavioural optionality could vary not only under the interest rate shock and stress scenario but also across other dimensions. These considerations are contained in **Appendix 1.**

## 4.6 Measurement System

21. Measurement systems and models used for IRRBB should be based on accurate data, and subject to appropriate documentation, testing, and internal controls.

22. Banks should have an effective internal validation framework for their IMS and models incorporating methodological evaluation, ongoing model monitoring, and analysis of model outcomes.

## 4.7 Reporting

23. Measurement outcomes of IRRBB and, where applicable, hedging strategies should be reported to the board and the relevant board committees on a regular basis. The reports should be at the appropriate reporting level for every currency in which the banks have material exposures. The reports, as a minimum, should contain the following:

    a) Summaries of the bank's aggregate IRRBB exposures, and explanations to highlight the assets, liabilities, cash flows, and strategies driving the level and direction of IRRBB;

    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;

    d) Results of stress tests, including assessment of sensitivity to key assumptions and parameters; and

    e) Summaries of the reviews of IRRBB policies, procedures and adequacy of the measurement systems, including any significant findings of independent assessment and evaluations.

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

### 4.8 Disclosure

24. As part of its Pillar 3 reporting and public disclosure, banks should provide information on the level of their IRRBB exposure. **Please see Appendix 2 for the qualitative and quantitative disclosure requirements**. Specifically, banks should disclose the measured variation in EVE, i.e., ΔEVE and variation in NII, i.e., ΔNII under the prescribed interest rate shock scenarios set out in **Appendix 3** of this Guidance Note**.**

25. Where applicable, banks are also encouraged to disclose adequate information on internal measures of IRRBB that would assist the market in interpreting the mandatory disclosure as set out in **Appendix 2**. In order to improve comparability between banks, exposures should be calculated based on the following considerations:

#### 4.8.1 Variation in Economic Value of Equity (ΔEVE)

26. Banks' own equity should be excluded from computation of exposure level.

27. All cash flows from all interest rate-sensitive assets, liabilities and off-balance sheet items in the banking book in the computation of their exposure should be included.

28. Cash flows should be discounted using a risk-free rate[1]; and

29. The variation in economic value of equity (ΔEVE) should be computed with the assumption of a run-off balance sheet, where existing banking book positions amortize and are not replaced by any new business.

#### 4.8.2 Variation in net interest income (ΔNII)

30. All expected cash flows arising from all interest rate-sensitive assets, liabilities and off- balance sheet items in the banking book should be included

[1] The discounting factors should be representative of a risk-free zero-coupon rate.

31. 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; and

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

### 4.9 Capital Adequacy for IRRBB

33. Banks are required to specifically assess their internal capital requirements for IRRBB as part of their board approved ICAAP and in line with their risk appetite for IRRBB. Banks are responsible for evaluating the appropriate capital level to hold, and for ensuring that this is sufficient to cover IRRBB and its related risks. The contribution of IRRBB to the overall internal capital assessment should be based on either the standardised methodology or the IMS outputs, as applicable.

34. The overall level of capital should be commensurate with both the bank's actual measured level of risk (including for IRRBB) and its risk appetite, and should be duly documented in its ICAAP report.

## 5. Supervisory Responsibilities

35. As part of its Supervisory Review and Evaluation Process (SREP), the CBN will regularly collect sufficient and relevant information to be able to:

a) monitor industry trends with respect to IRRBB exposures;

b) assess the soundness of banks' IRRBB management; and

c) identify outlier banks that will be subject to further review and/or Pillar 2 IRRBB capital add-on.

36. For the purpose of identifying an outlier bank, the CBN will implement at least one outlier/materiality test that compares a bank's maximum ΔEVE, under the six prescribed interest rate shock scenarios set out in

**Appendix 3**, with 15% of its Tier 1 capital, computed in line with the disclosure requirements outlined in **Section 4.8.**

## 6. The CBN Standardised Framework

37. The Standardised Methodology (SM) is applicable where a bank's IMS does not meet the conditions specified in **Section 3.2** of this Guidance Note, or where it voluntarily elects to apply the SM. The SM is based on the Standardised framework as contained in the BCBS standards on interest rate risk in the banking book published in April 2016. The focus of the SM is the measurement of the ΔEVE. **Please see Appendix 4 for full details of the SM.**

38. The steps involved in measuring banks' ΔEVE for IRRBB are as highlighted below:

i) **Stage 1:** Interest rate-sensitive banking book positions are allocated to one of three categories (i.e. amenable, less amenable and not amenable to standardisation).

ii) **Stage 2:** Determination of slotting of cash flows based on repricing maturities. This is a straightforward translation for positions amenable to standardisation. For positions less amenable to standardisation, they are 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.

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 as set out in **paragraphs 8 to 13 under Appendix 4**

(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 may rely on a scenario-dependent look-up table set out under paragraph 22 and 27 of Appendix 4.

iii) **Stage 3:** Determination of ΔEVE for relevant interest rate shock scenarios for each currency. The ΔEVE is measured per currency for all six prescribed interest rate shock scenarios.

iv) **Stage 4:** Add-ons for changes in the value of automatic interest rate options (whether explicit or embedded) are added to the EVE changes. Automatic interest rate options sold are subject to full revaluation (net of automatic interest rate options bought to hedge sold interest rate options wherever permitted or possible) under each of the six- prescribed 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.

v) **Stage 5:** IRRBB EVE calculation. The ΔEVE under the standardised framework will be the maximum of the worst aggregated reductions to EVE across the six prescribed interest rate shocks **(See Appendix 3)**.

## Appendix 1: Dimensions Influencing Behavioural Options

| Product | Dimensions influencing the exercise of the embedded behavioural options |
|---|---|
| **Fixed rate loans subject to prepayment risk**. Banks should understand the nature of prepayment risk for their portfolios and make reasonable and prudent estimates of the expected prepayments. The assumptions underlying the estimates and where prepayment penalties or other contractual features affect the embedded optionality effect should be documented. There are several factors that are important determinants of the bank's estimate of the effect of each interest rate shock and stress scenario on the average prepayment speed. Specifically, a bank must assess the expected average prepayment speed under each scenario. | Loan size, loan-to-value (LTV) ratio, borrower characteristics, contractual interest rates, seasoning, geographical location, original and remaining maturity, and other historical factors.<br><br>Other macroeconomic variables such as stock indices, unemployment rates, GDP, inflation and housing price indices should be considered in modelling prepayment behaviour. |
| **Fixed rate loan commitments.** Banks may sell options to retail customers whereby, for a limited period, the customers can choose to draw down a loan at a committed rate. Unlike loan commitments to corporates, where drawdowns strongly reflect characteristics of automatic interest rate options, mortgage commitments to retail customers are impacted by other drivers. | Borrower characteristics, geographical location (including competitive environment and local premium conventions), customer relationship with bank as evidenced by cross-products, remaining maturity of the commitment, seasoning and remaining term of the mortgage. |
| **Term deposits subject to early redemption risk.** Banks may attract deposits with a contractual maturity term or with step-up clauses that enable the depositor at different time periods to modify the speed of redemption. The classification scheme should be documented, whether a term deposit is deemed to be subject to redemption penalties or to other contractual features that preserve the cash flow profile of the instrument. | Deposit size, depositor characteristics, funding channel (e.g. direct or brokered deposit), contractual interest rates, seasonal factors, geographical location and competitive environment, remaining maturity and other historical factors.<br><br>Other macroeconomic variables such as stock indices, unemployment rates, GDP, inflation and housing price indices should be considered in modelling deposit redemption behaviour. |
| **NMDs.** Behavioural assumptions for deposits that have no specific repricing date can be a major determinant of IRRBB exposures under the economic value and earnings-based measures. Banks should document, monitor and regularly update key assumptions for NMD balances and behaviour used in their IMS. To determine the appropriate assumptions for its NMDs, a bank should analyse its depositor base in order to identify the proportion of core deposits (i.e. NMDs which are unlikely to reprice even under significant changes in interest rate environment). Assumptions should vary according to depositor characteristics (e.g. retail/wholesale) and account characteristics (e.g. transactional/non-transactional). | Responsiveness of product rates to changes in market interest rates, current level of interest rates, spread between a bank's offer rate and market rate, competition from other firms, the bank's geographical location and demographic and other relevant characteristics of its customer base. |

# Appendix 2: Disclosures

## Table A

**Purpose:** To provide a description of the risk management objectives and policies concerning IRRBB.

**Scope of application:** Mandatory for all banks within the scope of application set out in **Section 3**

**Content:** Qualitative and quantitative information. Quantitative information is based on the daily or monthly average of the year or on the data as of the reporting date.

**Frequency:** Annual.

**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 asset and liability management committee (ALCO), the bank's practices to ensure appropriate model validation, and timely updates in response to changing market conditions. |
| c | The periodicity of the calculation of the bank's IRRBB measures, and a description of the specific measures that the bank uses to gauge 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 in earnings. |
| e | Where significant modelling assumptions used in the bank's IMS (i.e. the EVE metric generated by the bank for purposes other than disclosure, e.g. for internal assessment of capital adequacy) are different from the modelling assumptions prescribed for the disclosure in Table B, the bank should provide a description of those assumptions and of their directional implications and explain its rationale for making those assumptions (e.g. historical data, published research, management judgment and analysis). |
| f | A high-level description of how the bank hedges its IRRBB, as well as the associated accounting treatment. |
| g | A high-level description of key modelling and parametric assumptions used in calculating ΔEVE and ΔNII in Table B, which includes:<br><br>For ΔEVE, whether commercial margins and other spread components have been included in the cash flows used in the computation and discount rate used.<br><br>How the average repricing maturity of non-maturity deposits in (1) has been determined (including any unique product characteristics that affect assessment of repricing behaviour).<br><br>The methodology used to estimate the prepayment rates of customer loans, and/or the early withdrawal rates for time deposits, and other significant assumptions.<br><br>Any other assumptions (including for instruments with behavioural optionalities that have been excluded) that have a material impact on the disclosed ΔEVE and ΔNII in Table B, including an explanation of why these are material. Any methods of aggregation across currencies, and significant interest rate correlations between different currencies. |
| h | 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 B

**Scope of application:** Mandatory for all banks within the scope of application set out **Section 3**

**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 | | | | |
| Steepener | | | | |
| Flattener | | | | |
| Short rate up | | | | |
| Short rate down | | | | |
| **Maximum** | | | | |
| **Period** | **T** | | **T–1** | |
| **Tier 1 capital** | | | | |

**Definitions**

For each of the supervisory prescribed interest rate shock scenarios, the bank must report for the current period and for the previous period:

a) the change in the economic value of equity based on its IMS, using a run-off balance sheet and an instantaneous shock or based on the result of the CBN standardised framework; and

b) 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.

## Appendix 3: The standardised interest rate shock scenarios

1. A bank should apply the six prescribed interest rate shock scenarios (highlighted below) to capture parallel and non-parallel gap risks for EVE and two prescribed interest rate shock scenarios for NII. Under this approach, IRRBB is measured by means of the following six scenarios:

   i) parallel shock up;

   ii) parallel shock down;

   iii) Steepener shock (short rates down and long rates up);

   iv) flattener shock (short rates up and long rates own);

   v) short rates shock up; and

   vi) short rates shock down

| | Specified size of interest rate shocks | | | | | |
|---|---|---|---|---|---|---|
| | **NGN** | **USD** | **EUR** | **GBP** | **CNY** | **Other** |
| Parallel | 400 | 200 | 200 | 250 | 400 | 400 |
| Short | 500 | 300 | 250 | 300 | 500 | 500 |
| Long | 300 | 150 | 100 | 150 | 300 | 350 |

2. Given Table above, the instantaneous shocks to the risk-free rate for parallel, short and long, for each currency, the following parameterisations of the six interest rate shock scenarios should be applied:

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

$$\Delta R_{parallel,c}(t_k) = \pm\overline{R_{parallel,c}}$$

   ii) *Short rate shock for currency c:* shock up or down that is greatest at the shortest tenor midpoint. That shock, through the shaping scalar $S_{short}(t_k) = (e^{-t_k/x})$, where x=4, diminishes towards zero at the tenor of the longest point in the term structure

$$\Delta R_{short,c}(t_k) = \pm\overline{R_{short,c}} * S_{short}(t_k) = R_{short,c} * e^{-t_k/x}$$

   iii) *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: $S_{long}(t_k) = 1 - S_{short}(t_k)$.

$$\Delta R_{long,c}(t_k) = \pm\overline{R_{long,c}} * S_{long}(t_k) = R_{long,c} * (1 - e^{-t_k/x})$$

   iv) *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:

$$\Delta R_{steepener,c}(t_k) = -0.65 * |* \Delta R_{short,c}(t_k)| + 0.9 * |\Delta R_{long,c}(t_k)|$$

$$\Delta R_{flattener,c}(t_k) = +0.8 * |* \Delta R_{short,c}(t_k)| - 0.6 * |\Delta R_{long,c}(t_k)|$$

# Appendix 4: The Standardized Methodology (SM)

## A. Introduction

1. The CBN requires banks whose IMS do not meet conditions set out in this Guidance Note (See section 3.2) to apply the Standardized Methodology (SM) in the computation of IRRBB. Banks may also voluntarily choose to adopt the SM. The SM is consistent with the BCBS Standardized Framework. The steps involved in measuring a bank's IRRBB, under the SM, based solely on EVE, are:

i) **Stage 1.** Interest rate-sensitive banking book positions are allocated to one of three categories (i.e. amenable, less amenable and not amenable to standardisation).

ii) **Stage 2.** Determination of slotting of cash flows based on repricing maturities. This is a straightforward translation for positions amenable to standardisation. For positions less amenable to standardisation, they are 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.

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 8 to 13 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 22 and 27 below.

**iii) Stage 3.** Determination of ΔEVE for relevant interest rate shock scenarios for each currency. The ΔEVE is measured per currency for all six prescribed interest rate shock scenarios.

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

v) **Stage 5.** IRRBB EVE calculation. The ΔEVE under the standardised framework will be the maximum of the worst aggregated reductions to EVE across the six supervisory prescribed interest rate shocks.

## B. Components of the SM

### 2.1 Cash flow bucketing

2. Banks must project all future notional repricing cash flows arising from interest rate-sensitive:

a) 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 and (ii) equity exposures in the banking book;

b) liabilities (including all non-remunerated deposits), other than CET1 capital under the Basel II/III framework; and

c) off-balance sheet items;

onto (i) ***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 onto (ii) the time bucket midpoints as set out in Table 1, retaining the notional repricing cash flows' maturity. Alternative (ii) requires splitting up notional repricing cash flows between two adjacent maturity bucket midpoints

| **Table 1. 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) | $O/N < t^{CF} \leq 1M$ (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) | $10 < t^{CF} \leq 15Y$ (12.5Y) | $15Y < t^{CF} \leq 20Y$ (17.5Y) | $t^{CF} > 20Y$ (25Y) | | |

3. 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

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-amortized principal has been repriced or not.

The date of each repayment, repricing or interest payment is referred to as its repricing date.

4. 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).

## C. Process for Slotting and Decomposing Banking Book Instruments

5. 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*

6. 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 amortizing 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.

7. Positions amenable to standardisation include positions 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. The CBN may allow banks to categorize other positions as amenable to standardisation and ignore the optionality if it can be shown to be of immaterial consequence.

*Process for positions not amenable to standardisation*

8. Positions not amenable to standardisation include (i) NMDs, (ii) fixed rate loans subject to prepayment risk and (iii) term deposits subject to early redemption risk.

## D. Treatment of NMDs

9. 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 below. Finally, banks should determine an appropriate cash flow slotting for each category, in accordance with the average maturity limits specified in Table 2.

### a) NMD categories

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

### b) Separation of NMDs

11. Banks should distinguish between the stable and the non-stable parts of each NMD category using observed volume changes over the past 10 years[2]. 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[3]. The remainder constitutes non-core NMDs.

12. 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 below.

[2] 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.
[3] Banks are expected to identify and assess all their material risk which may include credit risk spread in the bank book

### c) Cash flow slotting

13. 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.

14. 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 (%) | Cap on average maturity of core deposits (years) |
|---|---|---|
| Retail/transactional | 90 | 5 |
| Retail/non-transactional | 70 | 4.5 |
| Wholesale | 50 | 4 |

## E. Treatment of positions with behavioural options other than NMDs

15. 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*

16. 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 a bank'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.

17. Under the standardised framework, the optionality in these products is estimated using a two- step approach. Firstly, baseline estimates of loan prepayments and early withdrawal of fixed-term deposits are calculated given the prevailing term structure of interest rates.

18. 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*

19. 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.

20. Banks must determine (subject to CBN approval) the baseline conditional prepayment rate ( $\boldsymbol{CPR}_{0,c}^{p}$) for each portfolio $p$ of homogeneous prepayment-exposed loan products denominated in currency c, under the prevailing term structure of interest rates.

21. 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:

$$CPR_{i,c}^{p} = \min\left(1, \gamma_i \, . \, CPR_{0,c}^{p}\right)$$

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

22. Prepayment speeds vary according to the interest rate shock scenario. The multipliers $(\gamma_i)$ 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 | Scenario Multiplier ($\gamma_i$) |
|---|---|---|
| 1 | Parallel up | 0.8 |
| 2 | Parallel down | 1.2 |
| 3 | Steepener | 0.8 |
| 4 | Flattener | 1.2 |
| 5 | Short rate up | 0.8 |
| 6 | Short rate down | 1.2 |

23. 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:

$$CPR_{i,c}^{p}(k) = CPR_{i,c}^{s}(k) + CPR_{i,c}^{p}(k) \, . \, N_{i,c}^{p}(k-1)$$

where $CPR_{i,c}^{s}(k)$ refers to the scheduled interest and principal repayment, and $N_{i,c}^{p}(k-1)$denotes the notional outstanding at 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 6*.

***Term deposits*** *subject to early redemption risk*

24. 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.

25. If neither of these conditions is 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).

26. Banks must determine (to the CBN satisfaction) the baseline term deposit redemption ratio $TDRR_{0,c}^{p}$ 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 ($t_1$).

27. 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 $\boldsymbol{TDRR^{p}_{0,c}}$ by a scalar $u_1$ that depends on the scenario $i$, as follows:

$$\boldsymbol{TDRR^{p}_{i,c} = \min\left(1, u_1 . TDRR^{p}_{0,c}\right)}$$

where the values of the scalars $uuii$ are set out in Table 4.

**Table 4. Term deposit redemption rate (TDRR) scalars under the shock scenarios**

| Scenario number ($i$) | Interest rate shock scenarios | Scalar multipliers ($u_1$) |
|---|---|---|
| 1 | Parallel up | 1.2 |
| 2 | Parallel down | 0.8 |
| 3 | Steepener | 0.8 |
| 4 | Flattener | 1.2 |
| 5 | Short rate up | 1.2 |
| 6 | Short rate down | 0.8 |

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

$$\boldsymbol{CF^{p}_{i,c}(1) = TD^{p}_{0,c} . TDRR^{p}_{i,c}}$$

Where $\boldsymbol{TD^{p}_{0,c}}$ is the outstanding amount of term deposits of type *p*.

*Process for positions that are less amenable to standardisation*

29. This paragraph describes the methodology for calculating an add-on explicit automatic interest rate options, 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 bought 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 $\boldsymbol{\Delta FVAO^{0}_{i,c}}$, is calculated for each interest rate shock scenario i. The value change is given by:

   i) an estimate (to the satisfaction of CBN) 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) Similarly, for each bought 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 $\boldsymbol{\Delta FVAO^{q}_{i,c}}$ .

c) The bank's total measure for automatic interest rate option risk under interest rate shock scenario i in currency c is calculated as:

$$\boldsymbol{KAO_{i,c} = \sum_{0=1}^{n_c} \Delta FVAO^{0}_{i,c} - \sum_{q=1}^{m_c} \Delta FVAO^{q}_{i,c}}$$

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

30. 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 bought options, add any changes in market values reflected in the regulatory capital measure of the respective capital ratio (i.e. CET1, AT1 or total capital) to the total automatic interest rate option risk measure $\boldsymbol{KAO_{i,c}}$

## F. Calculation of the standardised EVE risk measure

31. First, the loss in economic value of equity $\boldsymbol{\Delta EVE_{i,c}}$ 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 $\boldsymbol{\kappa \in \{1,2,\dots,K\}}$ or time bucket midpoint $\boldsymbol{t_k}$, $\boldsymbol{\{1,2,\dots,K\}}$. Within a given time bucket $\boldsymbol{k}$ or time bucket midpoint $\boldsymbol{t_k}$, 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 $CF_{i,c}(\kappa)$, $\kappa \in \{1,2,\dots,K\}$.

b) Net notional repricing cash flows in each time bucket $\boldsymbol{\kappa}$ or time bucket midpoint tk, are weighted by a continuously compounded discount factor:

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

that reflects the interest rate shock scenario i in currency c as set out in Appendix 3, 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):

$$\boldsymbol{EVE_{i,c}^{nao} = \sum_{k=1}^{k} CF_{i.c}(k) * DF_{i,c}(t_k) \quad (maturity\ buckets)\ or}$$

$$\boldsymbol{EVE_{i,c}^{nao} = \sum_{k=1}^{k} CF_{i.c}(t_k) * DF_{i,c}(t_k) \quad (maturity\ bucket\ midpoints)}$$

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

$$\boldsymbol{\Delta EVE_{i,c} = \sum_{k=1}^{k} CF_{0.c}(k) * DF_{0,c}(t_k) - \sum_{k=1}^{k} CF_{i.c}(k) * DF_{i,c}(t_k) + KAO_{i,c}}$$

or, for maturity buckets midpoints:

$$\boldsymbol{\Delta EVE_{i,c} = \sum_{k=1}^{k} CF_{0.c}(t_k) * DF_{0,c}(t_k) - \sum_{k=1}^{k} CF_{i.c}(t_k) * DF_{i,c}(t_k) + KAO_{i,c}}$$

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:

$$\boldsymbol{Standardised\ EVE\ Risk\ Measure} = \underbrace{max}_{i\in\{1,2,\dots 6)} \{\mathbf{max}(0; \sum_{c:\Delta EVE_{i,c}>0} \underbrace{\Delta EVE_{i,c}}_{loss\ in\ currency\ c} )\}$$