



Prudential practice guide

APG 117 Capital Adequacy: Interest Rate Risk in the Banking Book

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About this guide

Prudential practice guides (PPGs) provide guidance on APRA's view of sound practice in particular areas. PPGs frequently discuss legal requirements from legislation, regulations, or APRA's prudential standards, but do not themselves create enforceable requirements.

Prudential Standard APS 117 Capital Adequacy: Interest Rate Risk in the Banking Book (APS 117) sets out APRA's requirements for an authorised deposit-taking institution (ADI) in relation to the management and measurement of interest rate risk in the banking book (IRRBB) and the holding of regulatory capital against this risk.

Prudential Standard CPS 220 Risk Management (CPS 220) sets out APRA's requirements for an ADI to have systems for identifying, measuring, evaluating, monitoring, reporting, and controlling or mitigating material risks that may affect its ability to meet its obligations to depositors. These material risks include IRRBB.

This PPG, *Prudential Practice Guide APG 117 Capital Adequacy: Interest Rate Risk in the Banking Book* (APG 117), aims to assist ADIs in complying with these requirements and, more generally, outline prudent practices in relation to the management and measurement of IRRBB. These requirements must also be read in conjunction with CPS 220, *Prudential Practice Guide CPG 220 Risk Management* (CPG 220) and *Prudential Practice Guide CPG 235 Managing Data Risk* (CPG 235).

Subject to the requirements of APS 117, an ADI has the flexibility to structure its business operations in a way most suited to achieving its strategic objectives. Not all practices outlined in this PPG will be relevant for every ADI and some aspects may vary depending upon the nature, scale and complexity of the ADI's operations.

Glossary

ADI	Authorised deposit-taking institution
APRA	Australian Prudential Regulation Authority
APS 117	<i>Prudential Standard APS 117 Capital Adequacy: Interest Rate Risk in the Banking Book</i>
Banking book item	An on-balance sheet asset, liability or equity item that is not part of an ADI's trading book, not deducted from an ADI's Common Equity Tier 1 (CET1) capital and not included in an ADI's CET1 capital; or an off-balance sheet position that alters an ADI's exposure to interest rate risk and is not part of the ADI's trading book.
Basel Committee	Basel Committee on Banking Supervision
Basis risk	The risk of loss in earnings or economic value of the banking book arising from imperfect correlation in the adjustment of interest rates earned and paid on different instruments with otherwise similar repricing characteristics. This may arise from differences between the actual and expected interest margins on banking book items, where 'margin' means the difference between the interest rate on the items and the implied cost of funds for those items.
Calculation date	The date with reference to which an ADI's IRRBB capital charge is calculated, such that the exposures and observations of interest rates used in the calculation are recorded at the close of business on that day.
Cross currency basis risk	The potential risk or uncertainty associated with the basis or spread between interest rates of two different currencies. It arises when there is a discrepancy or misalignment between the interest rates of two currencies in the foreign exchange market.
Embedded gains and losses	The gain or loss arising from past movements in interest rates that have not been recognised in accounts.
Expected shortfall	An ADI's prospective IRRBB capital charge is the ADI's estimate of a 97.5 per cent expected shortfall of the prospective loss. The percentage expected shortfall is the expected loss conditional on the loss being in the worst 2.5 per cent of potential losses.
Foreign ADI	Has the meaning given in section 5 of the Banking Act.
Gap risk	The risk that arises from the term structure of banking book instruments and describes the risk arising from the timing of interest rate changes associated with these instruments.

IRB ADI	An ADI which has been approved by APRA to use the internal ratings-based approach to credit risk.
Non-significant financial institution (non-SFI)	An ADI or its authorised non-operating holding company (NOHC) that is not a significant financial institution.
Optionality risk	The risk of loss in earnings or value due to cash flows varying from what an ADI had assumed, caused either by customers exercising stand-alone or embedded options differently from how the ADI had assumed they would, or by the operation of caps, floors and similar mechanisms that automatically adjust interest payments.
Repricing risk	The risk of loss in earnings or economic value caused by a change in the overall level of interest rates. This risk arises from mismatches in the repricing dates of an ADI's banking book items.
Significant financial institution (SFI)	An ADI (other than a foreign ADI) or authorised NOHC that has total assets above \$20 billion, or an ADI or authorised NOHC determined as such by APRA.
Single currency basis risk	The potential risk or uncertainty associated with the basis or spread between two interest rates denominated in the same currency. It arises when there is a discrepancy or misalignment between the interest rates of two financial instruments that are denominated in the same currency but have different underlying reference rates.
Yield curve risk	The risk of loss in earnings or economic value caused by a change in the relative levels of interest rates for different tenors (that is, a change in the slope or shape of the yield curve). Yield curve risk arises from repricing mismatches between assets and liabilities.

Introduction

- 1) APS 117 sets out the requirements that an ADI must meet to ensure it prudently manages IRRBB, including that an ADI must have an adequate risk management framework and governance arrangements. ADIs are required to have a framework to manage, measure and monitor IRRBB commensurate with the nature, scale and complexity of their operations. An ADI that has been approved to use an internal ratings-based approach to credit risk for the purpose of determining the regulatory capital requirement for credit risk (IRB ADI) must also determine its IRRBB capital charge to ensure it holds sufficient capital against its IRRBB exposures.
- 2) This PPG provides guidance to assist ADIs in meeting the requirements in APS 117, by setting out prudent practices relating to the management and measurement of IRRBB. ADIs have the flexibility to configure their IRRBB management framework in the way most suited to achieving their business objectives. However, this flexibility is subject to the requirements set out in APS 117.

Overview of IRRBB

- 3) Interest rate risk refers to an ADI's exposure to adverse movements in interest rates. IRRBB refers to the interest rate risk to an ADI's capital and earnings that affect the ADI's banking book positions. IRRBB is encountered by all ADIs and arises because interest rates vary over time, while the business of banking typically involves intermediation activities that produce exposures to both maturity mismatch (e.g. long-maturity assets funded by short-maturity liabilities) and rate mismatch (e.g. fixed rate loans funded by variable rate deposits).
- 4) Movements in interest rates impact the present value of future cash flows, which impact the underlying and economic value of an ADI's assets, liabilities, and off-balance sheet items. Changes in interest rates also impact income and expenses that are sensitive to interest rates, which impact an ADI's net interest income.
- 5) IRRBB is measured in terms of earnings at risk, economic value sensitivity and net interest income. Given the impact of movements in interest rates on both economic value and net interest income, if IRRBB is not managed appropriately, it can pose significant risks to an ADI's capital base and future earnings. APRA expects ADIs to effectively manage IRRBB as part of their ongoing business operations and, where necessary, hold capital to cover potential losses.
- 6) Failure of the Board or senior management to manage an ADI's IRRBB can lead to the failure of an ADI, both caused explicitly by IRRBB and from IRRBB flow-on effects. For example, ignoring or mismanaging the risk of interest rate rises to the value of an ADI's investments in fixed-rate assets (e.g. bonds), may lead to large losses and non-viability.

Figure 1. The impact of interest rate movements on IRRBB



Chapter 1 – Guidance for all ADIs

This section provides guidance on APS 117 paragraphs 14-16.

- 7) This Chapter provides guidance for all ADIs in meeting the key IRRBB requirements in APS 117.
14. IRRBB is a material risk and is a category of market and investment risk under *Prudential Standard CPS 220 Risk Management* (CPS 220). As part of its risk management framework required under CPS 220, an ADI must ensure that it appropriately manages its IRRBB, commensurate with the nature, scale and complexity of its operations.
- 8) APRA requires all ADIs to meet the requirements within CPS 220 and ensure that it appropriately manages its IRRBB, commensurate with the nature, scale and complexity of its operations. These include requirements relating to the:
- a) IRRBB risk management framework;
 - b) responsibilities of the Board of directors;
 - c) responsibilities of the IRRBB senior management and IRRBB management function;
 - d) internal reporting of IRRBB exposures and data governance;
 - e) integration of IRRBB measurement system into day-to-day risk management; and
 - f) independent review of the IRRBB risk management framework.
- 9) As an example, in meeting the requirements of CPS 220 and appropriate management of IRRBB, APRA expects a prudent ADI to have regard to its choice of the maturity profile of shareholders' equity, which can have a material impact on an ADI's IRRBB exposure.
15. An ADI's senior management must regularly (at least semi-annually) report its IRRBB exposure to its Board or Board committee.
- 10) APRA would expect the ADI's senior management to continually monitor its IRRBB exposure and increase the frequency of this reporting to the Board or Board Committee where there are material issues. For example, where the ADI's interest rate risk profile is inconsistent with its risk appetite.

Adequacy of IRRBB management

16. Where APRA determines that an ADI is not appropriately managing, measuring or monitoring its IRRBB or is carrying excessive interest rate risk, APRA may require the ADI to hold additional

regulatory capital, commensurate with its IRRBB and/or, in the case of a non-SFI or an SFI that does not have IRRBB model approval, comply with all or additional requirements in this Prudential Standard.

- 11) APRA may impose additional requirements where APRA considers an ADI is not managing, measuring, or monitoring its interest rate risk appropriately or is carrying excessive interest rate risk relative to the nature, scale and complexity of the ADI's operations.
- 12) APRA will use the 'outlier' test and additional supervision to identify ADIs that may be considered as potentially having high risk relative to their size and complexity. The 'outlier' test will use a set of risk metrics including Capital-At-Risk (based on six prescribed interest rate scenarios), level of derivative usage in banking book, size of security portfolio and any high-risk investments such as low-grade corporate bonds.
- 13) The six interest rate shock scenarios include a:
 - a) parallel up;
 - b) parallel down;
 - c) steeper shock (short rates down and long rates up);
 - d) flattener shock (short rates up and long rates down);
 - e) short rates shock up; and
 - f) short rates shock down.
- 14) APRA will investigate all outliers and apply supervisory discretion to require the high-risk entities to comply with specific qualitative requirements in APS 117. This may also include requiring the ADI to hold more regulatory capital.

Chapter 2 – Management framework and governance

This section provides guidance on paragraphs 34 to 63 of APS 117.

- 15) This Chapter provides guidance on the implementation of requirements relating to the IRRBB management framework and governance. An ADI must satisfy requirements in APS 117 in a way that is commensurate with the nature, scale, and complexity of the ADI's operations. This is consistent with APRA's principle of proportionality across ADIs.
- 16) An effective IRRBB management framework supports the Board to monitor and manage IRRBB. An ADI is expected to conduct regular independent reviews and evaluations of the effectiveness of its IRRBB management framework to ensure it meets this purpose, with the framework commensurate with the nature, scale, and complexity of the ADI's operations.

IRRBB management framework

34. As part of its risk management framework required under CPS 220, an ADI must develop and maintain:

- 17) CPS 220 requires APRA-regulated entities to have adequate risk management frameworks for material risks. CPS 220 identifies market and investment risk, which includes IRRBB, as a material risk. As such, CPS 220 requires an ADI to have an IRRBB risk management framework that is consistent and integrated with the risk profile and capital strength of the ADI, supported by a risk management function and subject to comprehensive review. Risk management frameworks generally include the following features:
 - a) appropriate approval processes;
 - b) exposure limits;
 - c) reviews; and
 - d) other mechanisms designed to provide a reasonable assurance that risk management objectives are being achieved.

34(a) an assessment of the ADI's IRRBB profile with a defined risk appetite statement articulated in terms of the risk to both economic value and earnings and must specify limits on both those risks;

- 18) When setting these limits, APRA expects an ADI to consider whether they are appropriate to the nature, scale, complexity, and capital adequacy of the ADI, as well as its ability to measure and manage its risks.

- 19) Depending on the nature of an ADI's activities and business model, an ADI may also implement sub-limits for individual business units, portfolios, instrument types or specific instruments. The level of detail of risk limits would reflect the characteristics of the ADI's holdings, including the various sources of the ADI's IRRBB exposures. ADIs with significant risk exposures would also establish appropriate risk tolerances.
- 20) In setting the risk appetite statement for the ADI, APRA expects there to be an appropriate interaction between balancing economic value and earnings objectives (e.g. economic-value sensitivity and earnings-at-risk measures) and that this interrelationship does not limit the effectiveness of each objective.

34(b) clearly articulated responsibilities of, and reporting relationships to, the Board and where applicable, the Board committee; and

34(c) accountabilities for monitoring an ADI's exposures against limits, approving variation on limits, and responding to and escalating any breaches of IRRBB limits to the Board and/or senior management as appropriate.

21) An ADI's IRRBB management framework ensures the integrity of the IRRBB management process. An ADI's IRRBB management framework promotes effective and efficient operations, reliable financial and regulatory reporting, and compliance with relevant laws, regulations, and internal policies.

22) When developing a risk management framework specifically for IRRBB, APRA expects an ADI to include IRRBB identification, measurement, monitoring, and control functions. These functions would have clearly defined responsibilities that are sufficiently independent from risk-taking functions of the ADI and that report IRRBB exposures directly to the Board or its relevant committees.

35. An ADI must notify APRA prior to making any material change to its IRRBB management framework.

23) An example of a 'material' change may include where the change resulted in a significant amendment to the ADI's risk appetite statement. Routine business structure changes that are insignificant would not require APRA notification. APRA expects the notification to be in written form.

Responsibilities of the Board

36. An ADI's Board, or Board committee, must regularly (at least semi-annually) review IRRBB management reports (refer to paragraphs 50 to 53 of this Prudential Standard) and satisfy itself that IRRBB is appropriately managed.

24) APRA expects that the Board would be able to understand the nature and the level of an ADI's IRRBB exposure so it can make informed decisions when approving business strategies as well as overall policies with respect to IRRBB. A prudent Board would ensure that there is clear guidance regarding the acceptable level of IRRBB, given the ADI's business strategies.

25) A Board may delegate duties relating to the ADI's IRRBB risk management framework, but not responsibilities. When delegating duties, APRA expects the Board to limit potential conflicts of interest by clearly identifying

these delegates, including relevant committees, and ensuring that there is an adequate separation of duties in key elements of the risk management process.

- 26) As part of the Board's responsibility for the ADI's IRRBB risk management framework, the Board ensures that steps are taken by the ADI to identify, measure, monitor and control IRRBB consistent with the approved strategies and policies. More specifically, the Board or its delegates are responsible for:
- a) appropriate limits on IRRBB, including the definition of specific procedures and approvals necessary for exceptions, and ensuring compliance with those limits;
 - b) adequate 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 ADI's IRRBB analysis;
 - c) a comprehensive IRRBB reporting and review process; and
 - d) effective internal controls and management information systems.
- 27) A prudent ADI would ensure that the Board's delegates, including relevant committees, for IRRBB include members with clear lines of authority over the units responsible for establishing and managing positions. This would include a clear communication channel to convey the delegates' directives to these line units.
- 28) The Board is ultimately responsible for setting the risk appetite for IRRBB and approving, at least annually, IRRBB limits. A prudent Board would ensure that IRRBB limits use metrics that measure the risks generated by all active and passive strategies, and do not themselves assume any strategy, therefore ensuring that all interest rate risk being generated is measured.
- 29) A Board may delegate periodic updates and escalations on economic value outcomes of the maturity profile of shareholders' equity to senior management. A prudent Board would regularly challenge, seek assurance and evidence from delegates, including relevant committees, to confirm whether or not the ADI's balance sheet management strategy (including the maturity profile for shareholders' equity) are consistent with the risk appetite and require delegates to take appropriate and timely action if it is not.
- 30) APRA expects that the Board, or Board committee, receives periodic updates and IRRBB management reports, which contain appropriate information supplied by senior management, to satisfy itself that IRRBB is appropriately managed. This may be different across ADIs and relative to an ADI's nature, scale and complexity of its operations. At a minimum, APRA expects an ADI's Board, or Board committee, to review at least semi-annually and at a greater frequency for ADIs with an approved IRRBB internal model.

Responsibility of senior management

41. Senior management must ensure that reporting to the Board or Board Committee enables the Board or Board committee to satisfy itself that IRRBB is appropriately managed. The reporting will at a minimum, include:
- (a) balance sheet management strategy (including maturity profile for shareholders' equity) with appropriate risk metrics that measure this strategy;

- 31) Where an ADI implements a strategy that includes an assumption for the maturity profile of shareholders' equity, APRA expects a prudent ADI to set risk metrics that appropriately capture the risk of loss on the maturity of shareholders' equity portfolio, with performance outcomes tracked over time and reported to senior management and the Board or Board Committee at an appropriate frequency.
- 32) It is considered prudent for an ADI's risk appetite limit metrics to measure the risks generated by all active and passive strategies, and as a strategy is not riskless, the metrics themselves would not assume any strategy, ensuring that all interest rate risk being generated is measured. For example, APRA would not expect a hypothetical portfolio that represents the assumed maturity profile of shareholders' equity to be included within the measurement of IRRBB. Excluding this hypothetical portfolio ensures the investment strategy itself is captured.
- 33) In ensuring that the Board or relevant Board Committee is informed of this strategy, it is considered prudent for the risk management function to provide constructive challenge of this strategy as well as effectively assessing whether the performance and risk of this strategy is adequately measured and monitored.
42. An ADI must have in place an executive committee, with appropriate representation from across the ADI, which focuses on the management and measurement of IRRBB. The executive committee must hold regular meetings to discuss matters including the performance of the framework, areas requiring improvement and the status of efforts to address previously identified deficiencies.
- 34) APRA expects the executive committee to receive appropriate information, data and reports to ensure that they have the ability to make informed decisions as well as the ability to provide challenge on IRRBB matters.

IRRBB risk management

43. In meeting its risk management requirements under CPS 220 for IRRBB, an ADI must:
- (e) provide challenge of the balance sheet management strategy (including maturity profile for shareholders' equity and balance sheet risk-taking).
- 35) For ADIs that employ a strategy that requires an assumption on the maturity of non-rate sensitive non-maturing assets and liabilities, APRA expects ADIs to:
- ensure the IRRBB risk management function provides adequate challenge of the balance sheet management strategy;
 - utilise a method that determines the balance and repricing profile of these non-rate sensitive non-maturing assets and liabilities, driven only by the expected behaviour of the products;
 - subject the method to the ADI's model risk management framework; and
 - capture and capitalise any resulting open risk position driven by hedges that use a different balance or repricing profile.

IRRBB measurement system

47. An ADI's IRRBB measurement system must have comprehensive and detailed documentation, which must, at a minimum, include:
- (b) for an ADI that has IRRBB model approval:
 - (i) enough detail to make the approach to determining the ADI's IRRBB capital charge transparent and capable of independent review, validation and independent reproduction of results given the raw input data;
- 36) In addressing the expected initial and ongoing validation activities, this documentation would establish a hierarchical process for determining model risk soundness based on both quantitative and qualitative dimensions such as size, impact, past performance, and familiarity with the modelling technique employed.
- 37) APRA expects that model risk management for IRRBB measures follow a holistic approach that begins with motivation, development and implementation by model owners and users. Prior to receiving authorisation for usage, the process for determining model inputs, assumptions, modelling methodologies and outputs are reviewed and validated independently of the development of IRRBB models. The review and validation results and any recommendations on model usage would be presented to and approved by the Board or its delegates, including relevant committees. Upon approval, the model would be subject to ongoing review, process verification and validation at a frequency that is consistent with the level of model risk determined and approved by the ADI.
- 38) APRA expects this ongoing validation process to establish a set of exception trigger events that obligate the model reviewers to notify the Board or its delegates, including relevant committees, in a timely fashion, to determine corrective actions and/or restrictions on model usage. Clear version control authorisations would be designated, where appropriate, to model owners. With the passage of time and due to observations and new information gained over time, an approved model may be modified or decommissioned. A prudent ADI would articulate policies for model transition, including change and version control authorisations and documentation.
- 39) APRA expects an ADI to not rely on a single measure of risk, given that risk management systems tend to vary in how they capture the components of IRRBB. Instead, a prudent ADI would use a variety of methodologies to quantify their IRRBB exposures under both the economic value and earnings-based measures, ranging from simple calculations based on static simulations using current holdings to more sophisticated dynamic modelling techniques that reflect potential future business activities.
48. As part of its stress testing program under CPS 220, an ADI must consider the impact on the economic value of the banking book and net interest earnings of sudden changes in interest rates.
- 40) When developing stress testing scenarios, an ADI is expected to incorporate:
- a) changes in portfolio composition due to factors under the control of the ADI (e.g. the ADI's acquisition and production plans);
 - b) changes in portfolio composition due to factors outside the control of the ADI (e.g. changing competitive, legal or tax environments);

- c) new products where only limited historical data are available; and
 - d) new market information and new emerging risks that are not necessarily covered by historical stress episodes.
- 41) An ADI may also perform qualitative and quantitative reverse stress tests, to:
- a) identify interest rate scenarios that could severely threaten an ADI's capital and earnings; and
 - b) reveal vulnerabilities arising from its hedging strategies and the potential behavioural reactions of its customers.
- 42) As part of an ADI's quantitative stress testing program, a prudent ADI would include the following six interest rate shock scenarios:
- a) parallel up;
 - b) parallel down;
 - c) steeper shock (short rates down and long rates up);
 - d) flattener shock (short rates up and long rates down);
 - e) short rates shock up; and
 - f) short rates shock down.
- 43) A prudent ADI would consider the opinions of its IRRBB experts when developing a stress testing programme for IRRBB. This may include utilising different experts within the ADI and/or external experts to identify relevant shock and stress scenarios for IRRBB, apply sound modelling approaches and to use stress testing results appropriately.

48. As part of its stress testing program under CPS 220, an ADI must consider the impact on the economic value of the banking book and net interest earnings of sudden changes in interest rates. This must at a minimum include:
- (b) scenarios involving changes in the level, slope and shape of yield curves, as well as changes in customer behaviour; and
 - (c) multiple stress scenarios, with some based on historical events and others being hypothetical and forward-looking;

- 44) A prudent ADI would consider a broader range of interest rate stress test scenarios, commensurate with the nature, scale and complexity of the ADI's operations.

Internal reporting of IRRBB exposures

- 45) While the types of reports prepared will vary based on the ADI's portfolio composition, they would typically include:

- a) summaries of the ADI's aggregate IRRBB exposures, and explanatory text that highlights the assets, liabilities, cash flows, and strategies that are driving the level and direction of IRRBB;
- b) reports demonstrating the ADI's compliance with policies and limits;
- c) key modelling assumptions such as core deposit 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 review of IRRBB policies, procedures, and adequacy of the measurement systems, including any findings of internal and external auditors and/or other equivalent external parties (such as consultants).

53. Senior management must notify the Board and APRA if its embedded gain is material in size relative to the remainder of its IRRBB capital charge, as set out in Attachment A to this Prudential Standard. This notification must include how the ADI is mitigating risks associated with this material embedded gain.

- 46) Embedded gains can quickly dissipate if interest rates move adversely. An increase in embedded losses may result in an ADI not holding sufficient capital against its IRRBB. A prudent ADI would be aware of the materiality of its embedded gain in its IRRBB capital charge, and the impact a reduction in this embedded gain would have on its IRRBB capital charge if interest rates were to move adversely. Where this embedded gain forms a material component of an ADI's IRRBB capital charge, the ADI would report this to its Board and notify APRA, explaining how it is mitigating risks associated with a material embedded gain in its IRRBB capital charge. These mitigating actions may include, for example, an exit strategy assessing the realisability of the gain.
- 47) APRA expects an ADI to consider the embedded gain and loss component of the IRRBB capital charge as part of its capital management strategy. This would include referencing the materiality and expected volatility of the embedded gain, and the ADI's strategy to mitigate any risks, as part of its Internal Capital Adequacy Assessment Process, as required by Prudential Standard APS 110 Capital Adequacy (APS 110).

Integration of IRRBB measurement system into day-to-day risk management

54. An ADI's IRRBB measurement system must be closely integrated into the ADI's risk management processes. This requires that the inputs and outputs of the ADI's IRRBB measurement system, as relevant, play an integral role in the ADI's decision-making, corporate governance, risk management and internal capital allocation processes.

- 48) For ADIs that have received IRRBB model approval, APRA does not expect that IRRBB models used for internal risk management purposes must exactly match the IRRBB model for regulatory purposes, where the latter is constrained by the requirements in APS 117 Attachment A. For example, APRA does not expect an ADI to make interest rate hedging decisions based solely on the output of an approved regulatory model, compared to an internal risk management model.

49) The IRRBB measurement system is broader than just the approved IRRBB model. It also encapsulates the input and output data, limits and associated model risk governance, controls, and oversight.

Data

50) In meeting its prudential requirements under APS 117, an ADI would utilise guidance, where relevant, provided in Prudential Practice Guide CPG 235 Managing Data Risk.

57. An ADI's IRRBB exposure data must comprehensively capture all material exposures from appropriate business activities, banking book items and geographic locations. An ADI must be able to demonstrate that any excluded exposures, both individually and in aggregate, would not have a material impact on the overall estimate of its IRRBB capital charge.

51) A prudent ADI would automate data inputs as much as possible to reduce administrative and human error. APRA expects an ADI to periodically review data mapping and test this data mapping. While an ADI is expected to automate data inputs, it would still monitor the type of data extracts and set appropriate controls.

52) Where cash flows are slotted into different time buckets (e.g. for repricing 'gap' analyses) or assigned to different vertex points to reflect the different tenors of the yield curve, an ADI would ensure the slotting criteria is stable over time to allow for a meaningful comparison of risk figures over different periods.

Independent review of risk management framework for IRRBB

60. For an ADI with an approved IRRBB model, such reviews must take place at the time of the IRRBB model approval and thereafter at least once every three years and when a material change is made to the IRRBB management framework. A summary of the results of the review must be provided to the Board or Board committee. An ADI must provide a report on the review to APRA within three months of its completion.

53) APRA expects an ADI with an approved IRRBB model to perform an independent review of their change to the IRRBB model at the time of a material model change request to APRA for approval. The independent review can be performed by either an internal or external independent party, and is to be submitted to APRA as part of the material model change request.

Chapter 3 – Approved IRRBB models

This section provides guidance on Attachment A to APS 117.

54) APS 117 requires IRB ADIs to hold regulatory capital for IRRBB. The regulatory capital requirement is determined by the IRRBB capital charge, which is outlined in Attachment A to APS 117. IRB ADIs are required to hold capital against the risk-weighted assets determined by the IRRBB capital charge, as set out in APS 110. This Chapter provides guidance for IRRBB model approved ADIs implementing requirements relating to the IRRBB capital charge.

IRRBB capital charge

55) The IRRBB capital charge estimates the potential loss to the current and prospective risk to the ADI's capital and earnings arising from adverse movements in interest rates that affect the ADI's banking book positions. APS 117 requires an ADI to hold sufficient capital to absorb this loss.

2. The IRRBB capital charge is calculated as:

$$\max_{m \in \{central, shorter, longer\}} IRRBB \text{ capital charge}_m$$

where for a given repricing assumption $m \in \{central, shorter, longer\}$, $IRRBB \text{ capital charge}_m$ at a calculation date d is the greater of zero and:

$$\max \left(ICC_d, \frac{1}{3} (ICC_{d1} + ICC_{d2} + ICC_{d3}) \right) + EL_d + OCC_d + OAA_d$$

Where:

$ICC_d, ICC_{d1}, ICC_{d2}, ICC_{d3}$ are respectively the prospective IRRBB capital charges at the calculation date and the latest three month-ends, determined in accordance with paragraph 18 of this Attachment;

EL_d is the embedded loss at the calculation date. This is defined as the sum over all items j within an ADI's augmented banking book of the book value of j minus the $PreShockEV_j$ determined in accordance with paragraph 18. For the avoidance of doubt, the ADI's augmented banking book is determined in accordance with paragraph 29 and includes an earnings offset. As such, EL_d incorporates an earnings offset. A negative EL_d is permissible and represents an embedded gain.

OCC_d is the optionality capital charge at the calculation date, determined in accordance with paragraph 38 of this Attachment; and

OAA_d is any other amount that APRA has notified the ADI it must include in the calculation of its IRRBB capital charge, or that has been calculated in accordance with a method specified by APRA.

- 56) When determining the IRRBB capital charge under paragraph 2 of Attachment A to APS 117, an ADI must consider its capital charge at the calculation date and the latest three month-ends. For example, when calculating the IRRBB capital charge for the June quarter, the calculation date d is June-end, and the latest three-month ends would correspond to April-end (d_1), May-end (d_2) and June-end (d_3). For this purpose, the capital charge at the calculation date, ICC_d , corresponds to and must be equal to the capital charge at the latest month-end, ICC_{d_3} , where d and d_3 correspond to the same date.
- 57) The OAA_d term includes any other amount that APRA has notified the ADI must include in the calculation of its IRRBB capital charge. For example, APRA-imposed and/or bank-applied capital overlays.
- 58) For the purposes of the IRRBB capital charge under paragraph 2 of Attachment A to APS 117, an ADI is required to first reflect today's value of banking book items. For this, the ADI needs to compare the current value (the economic value of items with all the changes reflected) against the carrying value of capital, with the adjustment reflected in the EL_d term. For instance, where a cash flow hedge relationship is used, the effective portion of the cash flow hedge reserve that relates to the hedging of items that are not recorded at fair value on the balance sheet is reflected as zero. In this instance, the EL_d term is the marked-to-market value.
- 59) All banking book items (both accrual and mark-to-market accounted) are to be captured in the embedded loss calculation. For market-related items where the book value is equal to the economic value, this results in a zero value for the embedded loss calculation.

Classification of banking book items

4. All securities in the banking book excluding debt, Additional Tier 1 Capital and Tier 2 Capital issued by the ADI are classified as market-related items. An ADI must designate each banking book item not covered by the previous sentence as either a market-related item or a non-market-related item. The criterion for making such designations forms part of the approved IRRBB model, must be documented, and any change to it constitutes a model change that requires APRA approval.

- 60) APRA expects that all securities in the banking book, excluding debt, Additional Tier 1 capital and Tier 2 capital issued by the ADI would be classified as market-related items. All residential mortgage-backed securities (RMBS) and floating rate notes (FRNs) would also be included as market-related items, with the spread risk generated from these securities included in the IRRBB capital charge calculation. The interest rate risk would be modelled out to the expected maturity for all RMBS.

5. Where an ADI holds securities issued in a securitisation:

- (a) if the ADI is an originating ADI of the securitisation, as defined in *Prudential Standard APS 120 Securitisation*, and the ADI treats the securitisation's underlying assets as on-balance sheet assets of the ADI under *Prudential Standard APS 112 Capital Adequacy: Standardised Approach to Credit Risk* or *Prudential Standard APS 113 Capital Adequacy: Internal Ratings-based Approach to Credit Risk*, the ADI must consolidate the balance sheet of the securitisation vehicle with the ADI's balance sheet for the purpose of this Prudential Standard; or

- 61) Where an ADI undertakes a funding-only (including self-securitisation) RMBS, an ADI looks-through to the underlying assets for prudential purposes. That is, the RMBS securities where look-through occurs may be

treated as non-market-related items. No spread risk capital charge would be calculated for these securities. All other RMBS, including capital-relief securitisations, may be included as market-related items.

- 62) Where look-through is applied for securitisations, all balance and off-balance sheet items and exposures of the special purchase vehicle (SPV) may be included in the approved IRRBB model if they were of the ADI. Any of the exposure to which the ADI was a counterparty would cancel out in the IRRBB capital charge calculation.
- 63) Where an ADI holds its own debt instruments, then the issued and the held security are two of the same and would both fall under non-market-related items. The issued and held security would cancel each other out and would not contribute to the IRRBB capital charge calculation.
- 64) Wholly owned self-securitisation of mortgages where the intent is to create an RBA repo-eligible security for liquidity purposes can be excluded from IRRBB capital calculations. Up until the point these securities are used as collateral under the repurchase agreement with the RBA, the self-securitisation does not exist for the purposes of APS 120.
- 65) All banking book derivatives are to be designated as market-related items, unless an ADI reasonably considers a banking book item is in an “effective hedge” relationship with a non-market-related item. In this case, the ADI may designate a banking book item as a non-market-related item. APRA allows flexibility for ADIs to rely on either accounting standard definitions for hedge effectiveness or the ability to use alternative approaches, which where appropriate, must be subject to APRA approval.
- 66) Notwithstanding the above, APRA expects ADIs to designate derivatives as non-market-related regardless of the accounting determination of hedge effectiveness. That is, the determination of derivatives can be modelled in a similar manner to the balance sheet item they hedge and is to be based on the ability to determine an economic hedge and not directly linked to the accounting standard. APRA expects ADIs to have an established governance process for monitoring and oversight for items that have an established “effective hedge”, as well as items that are identified as market-related or non-market-related.
- 67) APRA will not approve an ADI’s model that chooses market-related and non-market-related items designations in such a way to exclude from the IRRBB capital charge calculation risks such as single-currency basis risk or cross-currency basis risk, where material.
- 68) An ADI is able to treat an offshore wholesale funding package which includes effective hedges as ‘non-market-related’, where the ADI models the net AUD position, including if the ADI hedges the callable bonds cross-currency risk to the first call date.

9. A core deposit is a component of a portfolio of non-maturity deposits that

- (a) has a stable balance; and
- (b) pays an interest rate that:
 - (i) is managed by the ADI; and
 - (ii) does not usually change in response to movements in wholesale market rates.

An ADI must determine the balance and repricing profile of each core deposit by a method whereby the balance is expected to usually be no more than 90 per cent of the balance of the deposit product, or portfolio of products or parts thereof, in which it lies.

- 69) A core deposit is a component of a portfolio of non-maturity deposits that has a stable balance and pays an interest rate. A core deposit has a stable balance where it is unlikely to reprice even under significant changes in the interest rate environment.
- 70) Stable credit card balances are not to be included in the definition of core deposits, since by construction, they are not deposits. Instead, they are to be classified as an other principal-and-interest (OPI) item. This classification does not remove the ability for ADIs that have revolving lines of credit to allow use of replicating portfolios for credit card transactor balances.
- 71) An ADI may also consider non-interest-bearing products as core deposits if they meet the definition of a core deposit. These products can be viewed as paying a zero per cent interest rate.
- 72) APRA expects the stable balance of part of a portfolio of bonus interest accounts that forfeits the extra interest can be modelled as a core-deposit. Low interest rate products which give risk to fixed rate risk in bonus interest deposits are fit under the requirements for core balance modelling.
- 73) APRA does not expect an ADI to match internal modelling assumptions for core-deposits to the requirements in APS 117. That is, APRA does not expect ADIs to apply the same classification criteria and repricing assumptions for core-deposits for both internal management and regulatory capital calculations.

Interest rate data

12. ... An ADI may, with APRA's approval, use more than one NMR curve per currency to which an ADI has non-material exposures.

74) There are valid instances where multiple curves may be used to assign funds transfer pricing (FTP) rates. APRA expects ADIs to only do so where there is rational business logic, and it is part of an ADI's internal transfer pricing process.

13. An ADI must also identify and collect data to enable modelling of all non-issuer-specific risk factors for which changes in their values can cause material changes in the economic value of the ADI's market-related items. Where available, different risk factor collections ('curves') must be used for modelling the yields on different types and grades of debt issuers and different payment frequencies.

75) "Different payment frequencies" implies that single-currency basis risk and cross-currency basis risk is to be included.

14. An ADI must use an observation period of eight years, which is to be constructed as the concatenation of:

(a) Period A – fixed observation period (3.5 years), spanning 1 January 2020 to 30 June 2023; and

(b) Period B – rolling observation period (4.5 years), incorporating the latest data excluding Period A, and ending on a date no earlier than three months before the calculation date.

76) For determining the Period B component of the observation period, the Period B must end on a date no earlier than three months before the quarter-end included in the observation period. For example, if the June quarter is used, then the Period B end-date must be no earlier than three months before the end of June. Examples of how the observation period works in practice is provided in Attachment B to this PPG.

15. ... Period B observation dates within the eight-year observation period are to be updated quarterly.

77) ADIs are not permitted to update the observation period more regularly than quarterly. This is to ensure comparability across ADIs, that all ADIs use the same observation period and update the data on the same frequency.

Repricing assumptions

78) To estimate repricing and yield curve risks which form part of the prospective IRRBB capital charge, an ADI makes repricing assumptions regarding the repricing of items that do not have a contractually defined repricing date or where there is potential of significant variation between contractual and actual repricing dates.

25. The total value at a non-market-related item's inception date of all its notional cash flows, each discounted using the NMR curve for its currency, must not be materially different to the consideration paid to establish the item, or the initial book value of the item if there is no such consideration.

79) The value of a non-market-related (NMR) item at inception is based on the interest cash flows from the projected funds transfer pricing (FTP) rate assigned by the ADI and discounted using the corresponding curve. An ADI's FTP curve is not required to exactly match the NMR single discount curve per currency. However, APRA expects it to be similar and may not accept a repricing profile for such item if APRA considers it unrealistic or does not view it as appropriate.

80) For example, the FTP curve is not required to be exactly equal to the NMR single discount curve per currency when the time snaps of the FTP and valuation curves, or the repricing profile used to assign the FTP rate, does not match the repricing profile used to model the NMR item in the IRRBB model. For instance, the cash plus margin FTP methodology used to price and model overnight exposures may attribute some risk to the overnight indexed swap (OIS) curve and some other risk to the BBSW curve (e.g. 3-month rate). The FTP rate may be generated assuming a 3-month BBSW rate is hedged using a 3-month OIS each day to generate a replicating portfolio.

28. An ADI's augmented banking book is the ADI's banking book together with an earnings offset, which is a notional principal and interest items. The earning offset must be calculated as the economic value, as at the beginning of the holding period, of a notional twelve-month, equally weighted, monthly moving average portfolio of fixed-for-floating interest rate swaps. The total principal amount covered by the swaps is equal to the sum of the book value of all banking book items.

81) The earnings offset is an adjustment for the impact of interest rate changes on the economic value-based earnings during the holding period. In general, the adjustment tends to offset changes in the economic value of

the ADI's banking book. For example, an interest rate increase will generally reduce the economic value of the banking book, but economic value-based earnings will be higher for the period from the increase date to the end of the holding period.

- 82) APRA expects the IRRBB model to make the following assumptions when calculating the earnings offset:
- a) the ADI receives fixed-rate payments;
 - b) the maturity dates of the interest rate swaps are at monthly intervals from one to 12 months after the beginning of the holding period (time t);
 - c) the inception dates for the swaps maturing m months after time t back to $(12-m)$ months before time t ;
 - d) the fixed rate for each interest rate swap is the rate that would have applied at its inception given its original maturity; and
 - e) the principal amount of each swap incepted at k months before time t and maturing m months after t is $1/12$ times;
 - i) if $k+m=12$ (i.e. the swap has an original maturity of 12 months), the book value of the banking book at the swap's inception date, or
 - ii) the increase in the book value of the banking book over the month immediately preceding the swap's inception date.
- 83) Variations from the above assumptions may be considered by APRA on a case-by-case basis.
- 84) The earnings offset has a non-zero value at the calculation date. ADIs are to calculate the value of the earnings offset across each of the observation dates and construct the difference between the pre-shock and post-shock economic values to determine its impact on the ADI's IRRBB capital charge.
- 85) Both economic value and earnings-based measures of IRRBB are significantly impacted by an ADI's use of behavioural and modelling assumptions made for the purposes of risk quantification in their IRRBB model. These assumptions may include:
- a) expectations for the exercise of interest rate options (explicit and embedded) by both the ADI and its customers under specific interest rate shock and stress scenarios;
 - b) treatment of balance 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.
37. The shorter and longer assumptions are used to take account of the most common sources of optionality risk where customer payments differ from what was assumed in a behavioural repricing profile. These assumptions must be the same as the central assumptions for all items except fixed-rate assets, rate locks and core deposits...
- 86) Fixed-rate assets include loans and other items such as leases or hire purchases.

- 87) Optionality risk is captured by an ADI's IRRBB capital charge. Optionality risk in the banking book is the risk of losses arising due to the existence of stand-alone or embedded options in banking book items, to the extent that the potential for those losses is excluded from the measurement of repricing, yield curve or basis risks. In the case of options embedded in customer products, it will generally arise from customers exercising choices that cause the actual product repricing dates to deviate from those specified in the ADI's repricing assumptions.
- 88) The lack of causal relationship between interest rate changes and customers' exercise of embedded options does not necessarily mean that there is no optionality risk. Balances in a particular non-interest-bearing account may, for example, vary between quarters in a way that is unrelated to interest rates and therefore no correlation would be observed.
- 89) If that random balance variation gives an unusually sharp drop in the balance of the portfolio in a quarter that follows a quarter with a large rise in interest rates, the ADI will generally incur losses as it has to sell term assets at reduced prices to pay customers' withdrawals (assuming account balances were not invested overnight).
- 90) The below table summarises common products with behavioural optionalities and the dimensions influencing the exercise of the embedded behavioural options.

Table 2. Behavioural optionalities

Product	Description	Dimensions influencing the exercise of the embedded behavioural options
Fixed rate loans subject to repayment risk	<p>ADIs would be expected to 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.</p> <p>There are several factors that are important determinants of the ADI's estimate of the effect of each interest rate shock and stress scenario on the average prepayment speed. Specifically, an ADI would assess the expected average prepayment speed under each scenario.</p>	<p>Loan size, loan-to-value ratio, borrower characteristics, contractual interest rates, seasoning, geographical location, original and remaining maturity, and other historical factors.</p> <p>Other macroeconomic variables such as stock indices, unemployment rates, gross domestic product (GDP), inflation and housing price indices would also be considered in modelling repayment behaviour.</p>
Fixed rate loan commitments	<p>An ADI may sell options to retail customers (e.g. prospective mortgage buyers) 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 (i.e. pipelines) to retail customers are impacted by other drivers.</p>	<p>Borrower characteristics, geographic location (including competitive environment and local premium conventions), customer relationship with ADI as evidenced by cross-products, remaining maturity of the commitment, seasoning and remaining term of the mortgage.</p>
Term deposits subject to early redemption risk	<p>An ADI may attract deposits with a contractual maturity term or with step-up clauses that enable</p>	<p>Deposit size, depositor characteristics, funding channel (e.g. direct or brokered deposit), contractual interest rates,</p>

	<p>the depositor at different time periods to modify the speed of redemption.</p> <p>The classification scheme would 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.</p>	<p>seasonal factors, geographical location and competitive environment, remaining maturity, and other historical factors.</p> <p>Other macroeconomic variables such as stock indices, unemployment rates, GDP, inflation, and housing price indices would also be considered in modelling deposit redemption behaviour.</p>
Non-maturity deposits	<p>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. An ADI would be expected to document, monitor, and regularly update key assumptions for NMD balances and behaviour used in their IRRBB measurement system. To determine the appropriate assumptions for its NMDs, an ADI would be expected to 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 the interest rate environment). Assumptions would vary according to depositor characteristics (e.g. retail/wholesale) and account characteristics (e.g. transactional/non-transactional). It is expected for an IRB ADI to document the methodology for determining these assumptions as part of the ADI's approved IRRBB model.</p>	<p>Responsiveness of product rates to changes in market interest rates, current level of interest rates, spread between an ADI's offer rate and market rate, competition from other firms, the ADI's geographical location and demographic, and other relevant characteristics of its customer base.</p>

Attachment A – Internal model approval process

This section provides guidance on APS 117 paragraphs 21-27.

Internal model approval process

21. An application for IRRBB model approval must demonstrate that the model has undergone a sufficiently long period of internal monitoring and has performed satisfactorily over that period. The length of this monitoring period will depend upon the performance of the ADI's IRRBB management framework and its track record in managing and measuring IRRBB. APRA may approve the use of an IRRBB model by an ADI.
 - 1) For capital purposes, APRA may approve the use of an IRRBB model by an ADI. An application for IRRBB model approval must demonstrate that the model has undergone appropriate analysis, monitoring, governance, conceptual soundness and validation, including review of all model inputs, data and outputs. APRA expects ADIs to first engage with APRA prior to the ADI seeking internal model approval for IRRBB.
 - 2) An ADI must obtain APRA's approval prior to making any material changes to its approved IRRBB model. APRA expects that the ADI determines what constitutes a material change consistent with the ADI's materiality thresholds, definitions, and model risk policies. Request for a material model change must be supported by appropriate documentation and analysis (refer to paragraphs 11 to 32 of this Attachment).
 - 3) An ADI must notify APRA of any non-material model changes no later than three months after making the change. APRA expects ADIs to notify APRA in writing of the change, and at a minimum, provide a description and nature of the model change, implementation date, capital charge impact and governance process undertaken by the ADI.
 - 4) APRA may, at any time, vary or revoke an ADI's IRRBB model approval, or impose additional conditions on the approval if it determines that the ADI does not comply with APS 117 or if it is appropriate, having regard to the particular circumstances of the ADI.
 - 5) For example, APRA may impose a capital overlay as a condition on an ADI's IRRBB model approval (APRA-imposed) if APRA considers the ADI is not appropriately capitalising, measuring, monitoring or controlling its level of IRRBB risk, and there are gaps in an ADI's model governance framework. APRA-imposed overlays must continue to be held by the ADI unless APRA determines otherwise.
 - 6) APRA may require an ADI to reduce its level of IRRBB or increase its IRRBB capital charge.
 - 7) APRA expects ADIs to also apply their own capital overlay (bank-applied) proactively. APRA approval is not required for changes to an approved IRRBB model to include a bank-applied capital overlay, although APRA

expects an ADI to notify APRA where a bank-applied capital overlay is applied or removed. Capital underlays (i.e. a negative capital overlay) are not permitted under APS 117.

- 8) APRA expects that the ADI would seek approval from APRA prior to removing or reducing any APRA-imposed overlay. An overlay that varies naturally in size (e.g. percentage overlay) would not generally need such approval, provided that the variation is in line with the operation of the overlay as documented at the time of implementation.
- 9) APRA expects ADIs to maintain a register of all capital overlays (APRA-imposed and bank-applied). The register would usually contain, at a minimum, the affected model/s, a description, and size of the overlay (\$m IRRBB capital charge and equivalent RWA amount). An existing model or issues register containing such information could be sufficient for this purpose. The register would be kept up to date and made available to APRA upon request.
- 10) A prudent ADI would discuss with APRA whether, and if so how, to disclose any material adjustments to 'Pillar 1' RWA requirements, such as supervisory overlays, in public financial and regulatory reporting. Further guidance is provided in APG 110 (paragraph 10).¹

Information requests for ADIs seeking APRA's approval to make any material changes to its IRRBB model

22. An ADI must obtain APRA's approval prior to making any material changes to its approved IRRBB model. An ADI must notify APRA of any non-material changes no later than three months after making the change.
- 11) APRA expects an ADI that has received approval for the internal model approach under APS 117 to provide the following information when seeking approval from APRA to make any material change to their approved IRRBB model.
- 12) When submitting multiple documents, a document mapping table would be included that briefly explains the purpose of each document submitted. Wherever ADIs provide an updated document, an ADI would include a marked-up version in addition to a clean version.
- 13) For multi-model submissions, such as a model re-accreditation, and where submissions are provided in distinct packages of information over time, each package would be accompanied with a memorandum explaining the contents of the materials. Where documents provided in previous packages are relied upon, it would be specified unambiguously, including the document name and version number, along with the timestamp and means by which it was provided to APRA. An implementation project plan would be included with each submission, showing the expected contents of upcoming packages.
- 14) For a multi-model submission, an ADI would include a guidance document that summarises material model changes and key results. The consolidated results would be presented in a tabulated format.

¹ The Basel framework comprises three pillars. 'Pillar 1' is quantitative requirements for capital as set out in the prudential standards and measured in risk-weighted assets (RWA) terms. 'Pillar 2' is the supervisory review process, which includes supervision of risk management and may include adjustments to capital requirements. 'Pillar 3' is disclosure requirements designed to encourage market discipline.

- 15) An ADI may use their internal documents for their submissions, which may not follow the structure provided in this information request. In such cases, the ADI would provide a cover letter which summarises how the below expectations are met, with the reference to the location of the supporting material found in their internal document(s).
- 16) An ADI would provide the technical evidence (summary tables/graphs of test results, explanatory notes and conclusions) for assessments performed.

General information

- 17) An ADI that has previously received APRA approval for the use of internal models under APS 117 would include the following general information when seeking approval for an internal model:
 - a) evidence of compliance with model governance framework, including materials presented to committees for model approval (or oversight) as well as minutes of the meetings;
 - b) where management reports are impacted by the model change, an ADI would provide a sample of the new and old management reports, accompanied by the approvals from the appropriate oversight functions; and
 - c) for all material model system change submissions, including re-accreditations, an ADI would perform an independent review for the readiness of their implementations, as well as the effectiveness of the model governance. This review must be conducted by functionally independent, appropriately trained and competent personnel. APRA expects to receive the independent review report in the ADI's material model change submission.

Model Owner Documentation

- 18) An ADI would include the following model owner documentation when seeking approval for an internal model. In general, an ADI would include a statement from the model owner, explaining how they have concluded that the proposed model would satisfy the requirements of APS 117. Further, the model owner documentation would be dated and signed by the model owner.
- 19) At the minimum, the model owner's documentation will include three sections: (1) Scope; (2) Conceptual Soundness; and (3) Model implementations. Model owner's documentation would also report the RWA and regulatory capital impact of the proposed model change; where a range of results has been observed, this would be provided.

Scope

- 20) The model owner would include the following information in its submission:
 - a) define the use of the model, including a clear statement of purpose to ensure that the model is developed in line with its intended use;
 - b) provide a list of all in-scope products/portfolios;
 - c) provide a list of all proposed changes, mapped to products and portfolios impacted by the changes;

- d) describe the expected impact on the downstream systems and processes; and
- e) provide a list of all in-scope controls. This would include current controls as well as those that will be removed, introduced or altered as a result of the model change.

Conceptual soundness

- 21) The model owner documentation would include technical details for all model changes with the appropriate technical language that is commensurate with the complexity of the model. This would:
- a) cover all internal models for interest rate risk in the banking book, underlying valuation models and behavioural models;
 - b) include evidence of robust methodologies, sound design, theory, and logic underlying the model;
 - c) include analysis supporting the behavioural assumptions such as prepayment assumptions and rate lock assumptions;
 - d) include analysis supporting the split of non-rate sensitive deposits vs rate sensitive deposits, and analysis of repricing profile for non-rate sensitive deposit highlighting any difference between internal modelling assumptions and assumptions for regulatory reporting repricing purpose;
 - e) list all proxy assumptions, known model limitations and known model weaknesses, including an assessment of materiality and risk mitigation plans;
 - f) include evidence that the model owner has examined the robustness of model assumptions and the appropriateness of model limitations and weaknesses;
 - g) discuss models' expected behaviour under normal and stressed scenarios; and
 - h) include evidence that the judgmental and qualitative aspects of models are assessed. This should include any analysis performed for alternative methods considered as part of the model design.

Model implementation

- 22) The model owner documentation would include the details of tests performed by the model owner to ensure the accuracy of implementation. This would include:
- a) Strategy:
 - i) the implementation testing strategy should be clearly defined;
 - ii) materiality thresholds applied for model testing to be defined and justified; and
 - iii) professional judgments applied to model testing to be explained and justified.
 - b) Input Reliability and Suitability for Model Purposes:
 - i) evidence of assessing the appropriateness of model input parameters;
 - ii) empirical evidence supporting the methods used and variables selected for the model; and

- iii) evidence that the market data is appropriate and is consistent with the model assumptions. The assessment of market data should include theories, techniques, and assumptions for processing input data into quantitative estimates (e.g. interpolation schemes, constant maturity curves, etc).
- c) Model Stability, Testing and Performance:
- i) evidence that model output is consistent with the expected behaviour under normal and stressed market conditions, including sensitivity analysis and evaluation of assumptions;
 - ii) evidence that appropriate benchmarks are used to compare a given model's inputs and outputs to estimates from alternatives;
 - iii) for product pricing models, evidence of alignment between risk systems and official end-of-day valuation systems (fair value adjustments due to modelling and data deficiencies must be considered);
 - iv) evidence that model limitations do not have adverse impact on the expected outcome, detailing where appropriate the mitigants;
 - v) evidence of operational robustness, including diagrams for the end-to-end processes and controls, as well as evidence that a review has been performed for their correct implementation; and
 - vi) evidence that the full product population within the scope of the model are captured and tested.
- d) Ongoing Monitoring:
- i) evidence that appropriate controls are implemented for the ongoing monitoring of the model in order to identify, monitor and remediate model weaknesses or limitations.

Parallel Run (For Model Re-accreditation and Material Model System Changes)

- 23) For the purpose of internal model re-accreditation, an ADI would conduct a parallel run for a minimum period of three months. This would include an elaborate explanation for the parallel run strategy and outcome, including:
- a) spreadsheet of actual loss and profit experience, regulatory and internal risk measures (e.g. expected shortfall and value-at-risk) over the parallel run period for the following (where specific items are not available, please include reasons):
 - i) total banking book (total diversified risk);
 - ii) total diversified risk split by portfolio;
 - iii) total diversified risk split by risk factor (if available); and
 - iv) total diversified risk split by any other classification which is used internally (if available);
 - b) spreadsheet of stress testing results and other key internal market risk measures (e.g. economic capital, net interest earnings at risk) for the parallel run period and using the same portfolio splits above, where applicable;

- c) spreadsheet comparing daily key risk sensitivities for the current model and the proposed model that are materially impacted by the model change for the parallel run period at the total bank level.
- 24) The submission would also include:
- a) a regression analysis of the parallel run comparing the actual loss and profit experience for the current model and the proposed model for all desks;
 - b) a deviation analysis for at least the top and bottom 5th percentile of the results from the regression analysis and all observations exceeding the entity's threshold. This would explain the differences between models, and where appropriate, link those to model assumptions and/or limitations. The deviation analysis should identify all factors that aggregately contribute to at least 90% of the variations between the models;
 - c) a timeseries comparison of regulatory and internal risk measures (e.g. expected shortfall and value-at-risk) for the current model and the proposed model. Where appropriate, this would include an explanation of material deviations;
 - d) for the largest three deviations in the VaR parallel run results, a VaR P&L vector regression analysis which explains the differences between models, and where appropriate, link those to the identified model assumptions and/or limitations. This analysis should identify all factors that aggregately contribute to at least 90 per cent of the variations between the models.

Model validation

- 25) An ADI would include the documents from the independent model validation function when seeking approval for an internal model. APRA expects the model validation documentation to be dated and signed off by the appropriate authority (according to the ADI's model risk policy). This would include a statement on how the model approver concluded that the proposed model would satisfy the requirements of APS 117, as well as the ADI's model risk policy.
- 26) The model validation function is expected to provide, in a tabulated form, an inventory of model risk findings through the validation cycle, management response and model risk's conclusion. All open issues will need to have materiality assessment, clear path to remediation, and a closure timeline. The report must include the final model rating, per the ADI's model risk framework, and model register requirements.
- 27) At the minimum, the model validation documentation would include four sections: (1) Scope; (2) Conceptual Soundness; (3) Model implementation; and (4) Documentation.

Scope

- 28) The ADI's model validation function would independently assess the scope of the model, set out by the model owner. All items listed under paragraph 20 of this Attachment would need to be reviewed and be concluded on.
- 29) Further, the model validation document would clearly state the scope of its assessment. Where some aspects of the model (as set out by the model owner's scope) has been excluded from the independent assessment, this would be clearly identified and justified.

Conceptual soundness

- 30) This section would cover the technical details for the assessments performed assessing all items under paragraph 21 of this Attachment. In particular, including:
- a) an independent validation of the theoretical framework, assessing the quality of the model design and construction;
 - b) an independent assessment of model assumptions and limitations (including model assessor(s)' conclusion); and
 - c) evidence that the model validation has assessed processes and activities that are undertaken to verify that models are performing as expected, in line with their design objectives and business uses.

Implementation

- 31) This section would provide the outcome of the assessments performed for all items under paragraphs 22 and 23 of this Attachment. In particular,
- a) Strategy:
 - i) the validation strategy should be clearly defined;
 - ii) the independent assessment of materiality thresholds and professional judgments applied to model testing by the model owner, as per paragraph 22 of this Attachment; and
 - iii) materiality thresholds and professional judgments applied by model validators need to be defined and justified.
 - b) Input Reliability and Suitability for Model Purposes;
 - i) independent assessment that the market data is consistent with the model assumptions, and an independent assessment of data quality; and
 - ii) validation of input parameters - evidence of assessment of input parameters. ADIs should demonstrate that all external models used for generating parameters to the model under assessment are captured in their model governance framework.
 - c) Model Stability, Testing and Performance;
 - i) model validation should conclude that model outputs are consistent with the expected behaviour of the model;
 - ii) evidence of independent validation of the model output (e.g. replication of the model for a subset of products, stress testing the model and sensitivity analysis);
 - iii) evidence that appropriate benchmarks are used to compare a given model's inputs and outputs to estimates from alternatives;
 - iv) evidence that model validation has assessed the impact of model limitations on the expected outcome, and subsequently concluded on their appropriateness;

- v) validation of products population – Evidence that the full products population within the scope of the model are tested, as per paragraph 22 of this Attachment; and
 - vi) evidence of independent validation of the parallel run analysis performed by the model owner (see paragraphs 23 and 24 of this Attachment).
- d) Ongoing Monitoring:
- i) evidence that model validation has reviewed controls proposed by the model owner for the ongoing monitoring, and subsequently concluded on their appropriateness.

Documentation

32) Model validation is expected to perform an explicit assessment of the model owner documentation. This is to ensure the appropriateness of the provided technical details for methodologies, design, theory, and logic underlying the model to meet internal operational and regulatory requirements.

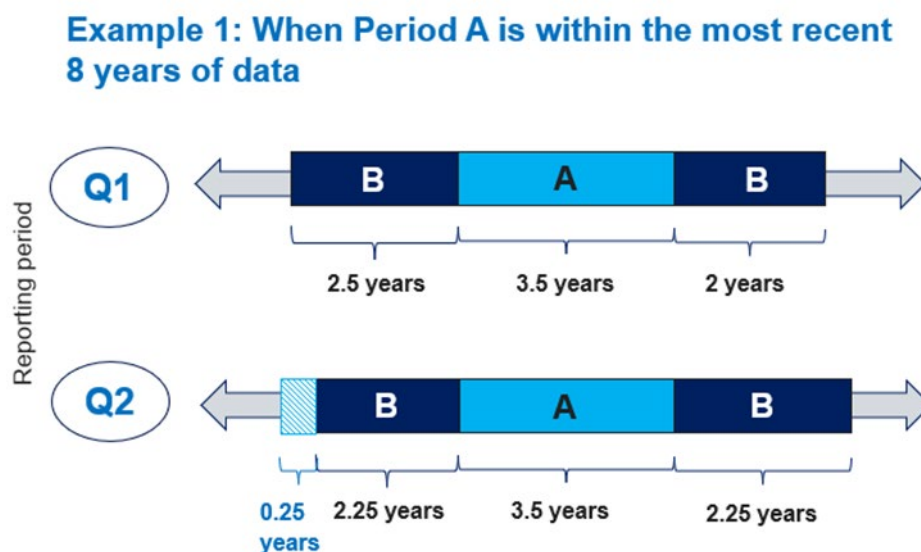
Attachment B – Observation period examples

This section provides guidance on APS 117 Attachment A Paragraph 14.

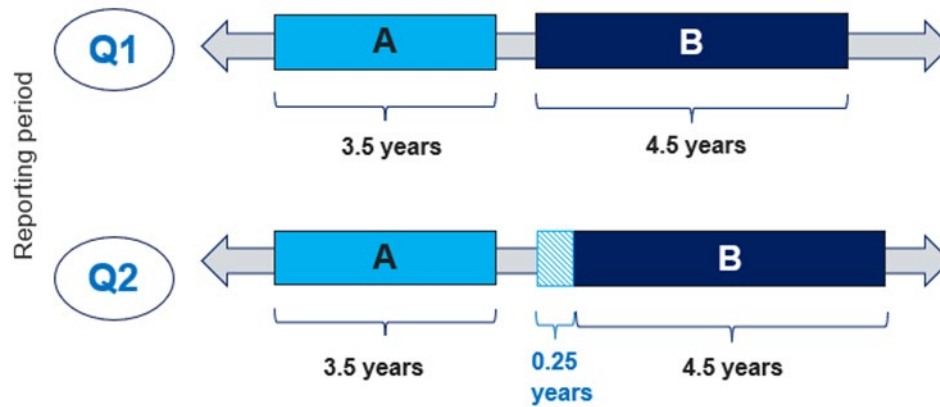
14. An ADI must use an observation period of eight years, which is to be constructed as the concatenation of:
- (a) Period A – fixed observation period (3.5 years), spanning 1 January 2020 to 30 June 2023; and
 - (b) Period B – rolling observation period (4.5 years), incorporating the latest data excluding Period A, and ending on a date no earlier than three months before the calculation date.

- 1) The below figure provides two examples on the concatenation of the observation period when Period A is within and not within the most recent years of data.

Figure 2. Examples of the observation period



Example 2: When Period A is not within the most recent 8 years of data



- 2) In moving from quarter 1 (Q1) to quarter 2 (Q2) reporting periods, Period B rolls forward one quarter (0.25 years) while Period A remains unchanged.
- a) Example 1 – the observation period is equivalent to the most recent eight years of data; and
 - b) Example 2 – the observation period is to concatenation of two non-overlapping periods, comprising eight years in total.