



Prudential Standard APS 117

Capital Adequacy: Interest Rate Risk in the Banking Book (Advanced ADIs)

Objective and key requirements of this Prudential Standard

This Prudential Standard sets out the requirements that an authorised deposit-taking institution with approval to use an internal model for interest rate risk in the banking book must meet for regulatory capital purposes, both at the time of initial implementation and on an ongoing basis.

The key requirements of this Prudential Standard are that an authorised deposit-taking institution must have:

- a framework to manage, measure and monitor interest rate risk in the banking book commensurate with the nature, scale and complexity of the institution's operations; and
- approval from APRA to use an internal model for determining the institution's capital requirement for interest rate risk in the banking book.

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Authority

1. This Prudential Standard is made under section 11AF of the *Banking Act 1959* (**Banking Act**).

Application

2. This Prudential Standard applies to **authorised deposit-taking institutions (ADIs)** that are seeking or have been given approval to use an **internal model** approach for interest rate risk in the banking book (IRRBB) for the purpose of determining **Regulatory Capital**.
3. A reference to an ADI in this Prudential Standard shall be taken as a reference to:
 - (a) an ADI on a **Level 1** basis; and
 - (b) a **group** of which an ADI is a member on a **Level 2** basis.
4. If an ADI to which the Prudential Standard applies is:
 - (a) the holding company for a group, the ADI must ensure that the requirements in this Prudential Standard are met on a Level 2 basis, where applicable; or
 - (b) a subsidiary of an **authorised non-operating holding company (authorised NOHC)**, the authorised NOHC must ensure that the requirements in this Prudential Standard are met on a Level 2 basis, where applicable.

Interpretation

5. Terms that are defined in *Prudential Standard APS 001 Definitions* appear in bold the first time they are used in this Prudential Standard.

Scope

6. For the purposes of this Prudential Standard, an ADI's banking book is comprised of the following items (banking book items):
 - (a) all on-balance sheet items with the exception of:
 - (i) items that are part of the ADI's trading book. An ADI's on-balance sheet and off-balance sheet positions may be allocated to the banking or trading books according to the ADI's trading book policy statement (refer to Attachment A to *Prudential Standard APS 116 Capital Adequacy: Market Risk* (APS 116)). APS 116 provides details for the purpose of calculating capital to be held against the interest rate risk in an ADI's trading book;

- (ii) items that are deducted from the ADI's **Common Equity Tier 1 Capital** under *Prudential Standard APS 111 Capital Adequacy: Measurement of Capital* (APS 111);
 - (iii) items included in the ADI's **Common Equity** Tier 1 Capital (refer to APS 111); and
- (b) all off-balance sheet items that alter the ADI's exposure to interest rate risk, other than positions that are part of the ADI's trading book. This includes derivatives transacted with other entities within the group of which an ADI is a member (and not part of the ADI's **Extended Licensed Entity**), for the purpose of determining interest rate risk Regulatory Capital on a Level 1 basis, or with other entities within the group of companies of which an ADI is a member that do not form part of the group, for determining such capital on a Level 2 basis.

Definitions

7. The following definitions are used in this Prudential Standard:

- (a) basis risk - the risk of loss in earnings or economic value arising 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;
- (b) earnings at risk - the potential impact of interest rate changes on the net interest income and non-interest income (and expense) earned on the ADI's banking book;
- (c) economic value sensitivity - the potential impact of interest rate changes on the present value of all future cashflows arising from the ADI's banking book items, including the economic value of non-interest cashflows;
- (d) IRRBB - the risk of loss in earnings or in the economic value on banking book items as a consequence of movements in interest rates. For the purposes of this Prudential Standard, reference is made to the IRRBB components of repricing risk, yield curve risk, basis risk and optionality risk;
- (e) IRRBB capital requirement - the Regulatory Capital that an ADI is required to hold against its exposure to IRRBB in accordance with this Prudential Standard;
- (f) IRRBB management framework - the organisational structures, processes and systems used in identifying, assessing, measuring, monitoring, controlling and mitigating IRRBB;
- (g) IRRBB measurement system - the systems and data of the IRRBB management framework used to measure IRRBB;

- (h) optionality risk - the risk of loss in earnings or economic value due to the existence of stand-alone or embedded options¹, to the extent that the potential for those losses is not included in the measurement of repricing, yield curve or basis risks;²
- (i) 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 dates³ of an ADI's banking book items; and
- (j) 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 liabilities⁴.

Key principles

8. An ADI that has received **model approval** from APRA for IRRBB must:
 - (a) have in place a robust IRRBB framework and a conceptually sound IRRBB measurement system; and
 - (b) hold regulatory capital commensurate with its exposure to IRRBB.

Approval process

9. An ADI that has sought model approval from APRA to use an internal ratings-based approach to credit risk or an advanced measurement approach to operational risk must also apply for model approval to use an internal model approach to IRRBB for Regulatory Capital purposes.
10. Any model approval granted may specify how the internal model is to apply in relation to the ADI, including approvals under other paragraphs of this Prudential Standard. APRA's prior written approval is required for any material changes to the internal model. Prior notification to APRA is required for material changes to other components of the IRRBB management framework. APRA may impose conditions on a model approval.
11. Once an ADI has obtained model approval, it must continue to employ that internal model unless APRA revokes the approval. Revocation at the request of the ADI may only occur in exceptional circumstances.

¹ An option provides the holder with the right but not the obligation to buy, sell, or in some manner alter the cash flow of an instrument or financial contract.

² In the case of options embedded in customer products, losses from optionality risk will arise from customers exercising choices that cause the actual product repricing dates to deviate from those specified by the repricing assumptions.

³ The repricing date of an ADI's asset, liability or other banking book item is the date on which the principal of that item is repaid (in whole or part) to, or by the ADI or on which the interest rate on that principal is reset, if earlier. The repricing profile of an asset, liability or other banking book item, or portfolio of items, is the set of all repricing dates and amounts repricing on those dates.

⁴ For most purposes under this Prudential Standard, repricing risk and yield curve risk (refer to paragraphs 7(i) and 7(j)) are grouped together and, except where specifically required, need not be disaggregated for measurement purposes.

12. APRA may, at any time in writing to the ADI, vary or revoke a model approval, or impose additional conditions on the approval if it determines that:
 - (a) the ADI does not comply with this Prudential Standard; or
 - (b) it is appropriate, having regard to the particular circumstances of the ADI, to impose the conditions or make the variation or revocation.
13. Where an ADI's model approval has been revoked or the ADI does not receive model approval from APRA for determining its IRRBB capital requirement, the ADI must determine that requirement based on an alternative approach that APRA specifies in writing, taking into account the nature of the ADI's interest rate risk.
14. An ADI that has received model approval may rely on its own internal estimate based on the approved model of IRRBB for determining its IRRBB capital requirement. That estimate must be fundamentally sound and consistent with the scope of IRRBB defined in paragraph 7(d) of this Prudential Standard.
15. APRA may, in writing, require an ADI with model approval to reduce its level of IRRBB or increase its capital if APRA considers that the ADI's capital for IRRBB is not commensurate with the ADI's risk profile.

Adoption of the internal model approach

16. APRA will generally require an ADI that has model approval to apply this model across all relevant business activities of the ADI. APRA recognises, however, that for many ADIs it may not be practical to implement an internal model across all business activities. This may be the case, for instance, where an ADI undertakes a new business activity, has acquired a new business through merger or acquisition or has certain immaterial business activities (refer to paragraph 21 of this Prudential Standard). In such circumstances, APRA's approval of the model may permit the ADI to use a combination of the internal model approach and an alternative APRA-agreed approach for regulatory capital purposes. This approach is referred to as 'partial use'.
17. An ADI must provide APRA with appropriate written information, both at the time of the initial application for use of the internal model approach and subsequent to the ADI obtaining model approval, on the business activities for which the ADI proposes not to use its internal model approach.
18. Approval for partial use of an internal model approach will, at a minimum, require that:
 - (a) all sources of IRRBB across the ADI are captured within its total amount of IRRBB capital requirement; and
 - (b) a substantial majority of an ADI's IRRBB is captured by its measurement system.

In the case of partial use of an internal model, diversification benefits for any part of the ADI's operations that is excluded from the IRRBB measurement system will not be recognised.

19. APRA may approve partial use of an ADI's internal model approach on a short-term basis. In this case, the ADI must adopt a phased roll-out of the internal model approach across all material business activities of the ADI. A phased roll-out may include (but need not be limited to) adoption of the internal model approach, in accordance with a specified timetable, across business activities within a particular legal entity or legal entities within the Level 2 group.
20. An ADI that has received approval to adopt a phased roll-out of the internal model approach must have a written APRA-approved implementation plan in place that specifies the extent and timing of roll-out of the internal model approach across all material business activities.
21. Permanent partial use of an internal model approach will be approved only in exceptional circumstances and where the ADI is able to demonstrate to APRA that those business activities to which the internal model does not apply are immaterial in terms of size and perceived risk profile. The calculated IRRBB capital requirement for such business activities, if considered necessary by APRA, may be subject to additional capital.

Interest rate risk in the banking book management framework

22. An ADI with internal model approval must have in place an IRRBB management framework that is sufficiently robust to facilitate quantitative estimates of its IRRBB capital requirement that are sound, relevant and verifiable. APRA must be satisfied that the ADI's IRRBB management framework is suitably rigorous and consistent with the complexity of its business. Where industry risk modelling practices evolve and improve over time, the ADI must consider these developments in assessing its own practices. Furthermore, the IRRBB measurement system must play an integral role in the ADI's risk management and decision-making processes and meet the requirements detailed in Attachment A. An ADI must also comply with the requirements relating to the Board of directors (**Board**) and senior management responsibilities in that Attachment.

Interest rate risk in the banking book measurement system

23. An ADI's IRRBB measurement system must:
 - (a) be conceptually sound, comprehensive, consistently implemented, transparent and capable of independent review and validation;
 - (b) be sufficiently comprehensive to capture all material sources of IRRBB across the ADI, including those events that can lead to rare and severe losses; and
 - (c) monitor the ADI's IRRBB risk profile in terms of earnings at risk and economic value sensitivity.

24. The IRRBB capital requirement under the internal model approach must cover repricing and yield curve risks and, unless APRA approves an exemption in writing (refer to paragraphs 25 and 26 of this Prudential Standard), basis risk and optionality risk.
25. Where an ADI is able to demonstrate to APRA that the potential loss from its exposure to basis and/or optionality risks is not significant when compared to the potential loss arising from repricing and yield curve risks, APRA may approve (at the time of approving the ADI's proposed internal model, or subsequently in writing) the exclusion of basis and/or optionality risks, as relevant, from the ADI's IRRBB regulatory capital.
26. An ADI with approval from APRA to exclude basis and/or optionality risks from its IRRBB regulatory capital must, at a minimum:
 - (a) review the level of its exposure to basis and/or optionality risks, as relevant, at least annually and provide the results of that review to APRA; and
 - (b) assess the impact of new products and changes to existing products, on its exposure to basis and/or optionality risks, as relevant, and report the details of that assessment to APRA where a significant change in its total exposure to basis risk and/or optionality risk is indicated.
27. For the purpose of determining the IRRBB capital requirement under the internal model approach, an ADI must use the economic value sensitivity approach to measure repricing and yield curve risks. For basis and optionality risks, APRA recognises that ADIs' measurement approaches are evolving. Accordingly, where an ADI is required to hold regulatory capital for these risks, no particular measurement technique is prescribed (although APRA may do so under paragraph 19 of Attachment B in certain cases).
28. An ADI's IRRBB measurement system must take into account the impact that past interest rate movements may have on its future earnings. In particular, the ADI must give consideration to embedded gains or losses⁵ in banking book items that are not accounted for on a marked-to-market basis. The IRRBB regulatory capital must include the effect of embedded gains or losses.
29. As part of the model approval process, an ADI must be able to demonstrate the appropriateness of the IRRBB capital requirement as determined by its internal model and commensurate with its IRRBB profile. An ADI must justify to APRA any changes in the calculated capital requirement as part of its ongoing use of an internal model.
30. An ADI must be able to demonstrate that its IRRBB capital requirement, as determined by its internal model, meets a soundness standard based on a 99 per cent confidence level and a one-year holding period (the soundness standard). This soundness standard provides significant flexibility for an ADI to develop

⁵ The total book value of a banking book item less the total economic value of that item is the item's embedded loss (if positive) or embedded gain (if negative).

an IRRBB measurement system that best suits the nature and complexity of its activities.

31. To estimate repricing and yield curve risks, an ADI must make repricing assumptions regarding the repricing of banking book items that do not have a contractually defined repricing date or where there is potential for significant variation between contractual and actual repricing dates due to, for example, embedded optionality in banking book products. These repricing assumptions must:
 - (a) specify one or more repricing dates and the principal amounts assumed to reprice on each of those dates; and
 - (b) be clearly documented and supported by appropriate analysis.

APRA will review the appropriateness of an ADI's repricing assumptions and may, in writing, determine that an ADI must use different assumptions for the purpose of determining its IRRBB capital requirement.

32. An ADI's IRRBB capital requirement must be calculated on at least a quarterly basis to ensure it adequately reflects its risk profile.
33. An ADI with model approval must meet the quantitative standards for measuring the capital requirement for IRRBB as detailed in Attachment B.

Attachment A

Governance and the interest rate risk in the banking book management framework

Responsibilities of the Board of directors and senior management

1. An ADI's Board is responsible for the overall IRRBB profile of the ADI and its IRRBB management framework. Accordingly, the Board must make clear its appetite for this risk, including IRRBB exposure limits. The Board or a Board committee must be actively involved in the oversight of the ADI's approach to managing and measuring IRRBB.
2. An ADI's IRRBB management framework must be approved by the Board, or a Board committee. In the latter case, the committee must have clearly defined responsibilities, thresholds for reporting to the Board and performance obligations. The approved framework must clearly articulate respective responsibilities and reporting relationships.
3. To ensure the continued effectiveness of the IRRBB management framework, the Board, or Board committee, must ensure the framework is subject to periodic validation and review (refer to paragraphs 18 and 19 of this Attachment) by a suitable independent party.
4. An ADI's Board, or Board committee, must review IRRBB management reports (refer to paragraphs 13 to 15 of this Attachment) on a regular basis and satisfy itself that this risk is appropriately managed.
5. Senior management must have a thorough understanding of the ADI's IRRBB management framework (to the extent that it relates to risk areas within their responsibilities), be actively involved in its implementation and ensure its effective operation over time. To facilitate this, the 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.
6. The ADI must have an independent IRRBB management function that complies with the requirements in this Attachment. This function must have a suitable independent reporting line, providing access to the executive committee referred to in paragraph 5 of this Attachment.
7. Senior management must, in conjunction with the IRRBB management function referred to in paragraph 6 of this Attachment, develop appropriate policies relating to the risk management framework. Management is responsible for translating these policies into specific procedures and processes to facilitate implementation and verification within the ADI's business operations. Senior management must provide notice to the Board, or Board committee, of material changes or exceptions from established policies that could have an impact on

the operation of the IRRBB management framework, including the IRRBB capital requirement.

Sufficient resources

8. An ADI must have sufficient numbers of personnel skilled in the management and measurement of IRRBB to ensure that its IRRBB management framework continues to operate effectively.

Interest rate risk in the banking book risk management function

9. An ADI must have an independent specialist IRRBB management function (function) that complies with the requirements set out in this Attachment. This function must:
 - (a) have reporting lines and responsibilities that are independent of the activities that contribute to the ADI's IRRBB profile;
 - (b) have all roles and responsibilities of people and functions involved in the management of IRRBB clearly defined and documented;
 - (c) have responsibility for the design and maintenance of an ADI's IRRBB management framework, and for ensuring its implementation; and
 - (d) continuously monitor the ADI's compliance with the framework and produce and analyse regular reports on the output of the internal model.

Documentation of interest rate risk in the banking book framework

10. An ADI's IRRBB management framework must be clearly documented.
11. Documentation relating to the IRRBB measurement system must be comprehensive and provide a level of detail sufficient to ensure that an ADI's approach to determining its IRRBB capital requirement is transparent and capable of independent review and validation.
12. An ADI's technical documentation relating to its IRRBB measurement system must include the following information:
 - (a) the rationale for all assumptions and specifications underpinning the IRRBB measurement system;
 - (b) the analytics and relevant theory behind all calculations;
 - (c) details of interest rate model parameters and assumptions, and any other assumptions made, whether implicitly within the model or explicitly as inputs to it, when modelling each component of IRRBB, including the ADI's justification for their use and the processes undertaken for checking and validating those assumptions;

- (d) an explanation of how the ADI ensures that the required soundness standard (refer to paragraph 30 of this Prudential Standard) is achieved; and
- (e) details of dependence structures used in the measurement system, including evidence supporting their use.

Internal reporting of interest rate risk in the banking book exposures

- 13. An ADI must implement a process to regularly monitor its IRRBB profile. To support the proactive management of this risk, there must be regular reporting of relevant information to the Board, or Board committee, and senior management.
- 14. In developing an appropriate reporting framework, an ADI must consider the nature of its IRRBB exposure and the strategy adopted for managing and measuring it. Management reports must be produced and reviewed regularly and include information on the output of the ADI's internal model, limit utilisation and the performance of risk management strategies. The reviews must be conducted by a level of management with sufficient seniority and authority to enforce, where necessary, mitigation of the ADI's exposure to IRRBB.
- 15. An ADI must have in place a process for ensuring that the ADI's Board, or Board committee, and senior management are able to respond appropriately to the information contained in IRRBB management reports. This process must include escalation procedures for key IRRBB issues to facilitate appropriate action between formal reporting cycles.

Integration of the interest rate in the banking book measurement system into day-to-day risk management

- 16. 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 measurement system, as relevant, play an integral role in the ADI's decision-making, corporate governance, risk management and internal capital allocation processes.
- 17. IRRBB exposure limits must be related to the ADI's internal model in a manner that is consistent over time and well understood by senior management.

Independent review of the interest rate risk in the banking book management framework and measurement system

- 18. An ADI's IRRBB management framework (including the IRRBB measurement system) must be subject to effective and comprehensive independent review both initially (that is, at the time the model approval is sought) and then on an ongoing basis, to ensure the continued integrity of the framework. Such reviews must be conducted by functionally independent, appropriately trained and competent personnel, must cover both the activities of relevant business units and of the IRRBB management function and must take place at least once every three years or when a material change is made to the framework.

19. For the purpose of paragraph 18 of this Attachment, ‘functionally independent’ means that:
- (a) the party or parties conducting the reviews do not contribute to the ADI’s IRRBB profile through the origination or alteration of risk; and
 - (b) the party or parties conducting the reviews must not be involved in the development, implementation or operation of the IRRBB measurement system, or be part of, or report to the risk management function referred to in paragraph 6 of this Attachment.

It is not necessary that the same party undertake all aspects of the review⁶.

⁶ In most cases, the independent reviews could be facilitated by an ADI’s internal audit function but may require the engagement of independent parties outside of this function.

Attachment B

Quantitative standards for measuring the capital requirement

Interest rate risk in the banking book measurement system track record

1. An ADI's IRRBB measurement system must have a reasonable track record in measuring this risk. Accordingly, before the ADI receives an IRRBB approval, the ADI must demonstrate to APRA that the system has undergone a sufficiently long period of initial internal monitoring prior to its use for the calculation of the capital requirement. 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.

Data

2. An ADI must have transparent and verifiable processes for collecting relevant data inputs (e.g. exposure information, details about customer behaviour and product and wholesale rate histories) on an ongoing basis. These processes must be consistent, timely and comprehensive across the ADI.
3. An ADI's IRRBB exposure data must be comprehensive in capturing all material exposures from all appropriate business activities, banking book items and geographic locations. The ADI must be able to justify that any excluded exposures, both individually and in aggregate, would not have a material impact on the overall estimate of its IRRBB capital requirement.

Interest rate data

4. For the purpose of determining the IRRBB capital requirement, the interest rates used and modelled by an ADI must include at least one yield curve in each material currency. Immaterial currencies may be combined into one or more groups and modelled using a single yield curve for each group based on a currency, or composite of currencies, broadly reflective of the interest rate characteristics of the group.
5. An ADI's IRRBB measurement approach must model each yield curve using a model that appropriately captures variation in the volatility of interest rates along the curve.
6. Regardless of the type of model used, interest rate assumptions will depend to a significant degree on the ADI's observation history of interest rates. The observation period must be at least six years, except where the ADI provides evidence that the use of a shorter observation period would provide a more appropriate distribution of future interest rates. Interest rate assumptions are not required to directly or exactly reflect the characteristics of the observation period but, where they do not, the basis for the difference must be explained and justified.
7. An ADI must update its interest rate data sets regularly and reassess its data sets whenever the interest rate environment is subject to major change.

8. Correlations between interest rates on the same and different yield curves must be recognised and included in an ADI's internal model. Correlation assumptions must be sound, justifiable and implemented with integrity.
9. An ADI must document the source of the interest rates used. If a derived or modified yield curve is used, the basis of derivation or modification must be documented.

Data policies

10. An ADI must document its IRRBB data management policies and procedures. These policies and procedures must cover:
 - (a) the collection of data;
 - (b) processes for ensuring integrity, completeness, consistency and accuracy;
 - (c) data storage;
 - (d) application purposes; and
 - (e) an outline of all data flows between systems, including whether any manual processes are involved in such flows.

Modelling repricing and yield curve risks

11. For the purpose of determining the IRRBB capital requirement for repricing and yield curve risks, an ADI's internal model must measure the maximum potential change in the economic value of the banking book (EVBB), as a consequence of changes in interest rates, for a 99 per cent confidence level and over a one-year holding period (consistent with the soundness standard detailed in paragraph 30 of this Prudential Standard).
12. The economic value of an individual banking book item is calculated as the net present value as at the beginning of the holding period, of expected future notional principal and interest cash flows. Notional cashflows should be discounted using the actual and simulated wholesale market interest rates as appropriate. EVBB is the sum of the economic value of all banking book items.
13. An ADI's internal model must estimate the 99th percentile of the distribution of EV0 minus EV1 where:
 - (a) EV0 is EVBB minus an earnings offset (refer to paragraph 17 of this Attachment). In this case, EV0 and EVBB are both calculated using the discount rates prevailing at the beginning of the holding period; and
 - (b) EV1 is EVBB minus an earnings offset (refer to paragraph 17 of this Attachment). In this case, EV1 and EVBB are both calculated using the discount rates simulated as prevailing at the end of the holding period.

EVO and EV1 are calculated on the same items using the same outstanding balances and repricing dates.⁷

14. The principal component of the notional cash flows must be derived using an ADI's repricing assumptions. The interest components relating to a principal payment must be calculated using historical wholesale rates (refer to paragraphs 15 and 16 of this Attachment).⁸
15. For banking book items with defined inception and principal payment dates, the historical wholesale rate applicable to a principal payment is the wholesale market rate applicable to a payment on the repricing date, taken from the yield curve applicable on the inception date of the instrument incorporating the principal payment. APRA will review the appropriateness of an ADI's choice of wholesale rates for the purposes of this paragraph and paragraph 12 of this Attachment and may, in writing, determine that the ADI must use different rates for the purpose of determining its IRRBB capital requirement.
16. For banking book items that do not have defined inception or principal payment dates, assumptions must also be made about inception dates. In such cases, the historical wholesale rate applicable to a principal payment will be determined as described in paragraph 15 of this Attachment but using the inception and principal payment dates specified in the ADI's repricing assumptions.
17. For the purposes of paragraph 13 of this Attachment, the earnings 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. For this purpose, the ADI receives fixed and makes floating rate payments and the total principal amount covered by the swaps is equal to the sum of the book value of all banking book items.
18. The above approach to the measurement of repricing and yield curve risks is based on the use of value-at-risk techniques on a static balance sheet. An ADI that develops new methodologies, such as the use of dynamic simulation, is encouraged to approach APRA to discuss the use of such methodologies within the capital adequacy framework. If APRA has already approved the ADI's internal model, it may be necessary for APRA to vary its approval to permit the use of a new methodology by the ADI.

Modelling basis and optionality risks

19. An ADI that does not have APRA's written approval to exclude basis and/or optionality risks from its IRRBB capital requirement and does not have a risk measurement model for these risks, must use a method approved by APRA in writing for determining an appropriate amount of regulatory capital for those risks.

⁷ EVO is a constant while EV1 is a random variable that is a function of the interest rates at the end of the holding period.

⁸ Repricing or principal repayments of assets must be interpreted as positive cash flows and repricing or principal repayments of liabilities interpreted as negative cash flows.

20. To the extent possible, the data sets and assumptions used for modelling repricing and yield curve risks and optionality and basis risks should be consistent.
21. An ADI's internal model for basis risk must explain the historical variation of margins between product interest rates and the implied cost of funds. In addition, the requirements regarding correlation assumptions detailed in paragraph 8 of this Attachment must be met.
22. An ADI's internal model for optionality risk must accurately capture the unique risks associated with optionality, including the non-linear price characteristics of implicit option positions.
23. An ADI's internal model may require assumptions about the behaviour of its customers when measuring the capital requirement for basis and optionality risks. Some of these assumptions, including those related to prepayment rates on fixed-rate loans, will be embodied within the ADI's repricing assumptions. Additional behavioural assumptions may be required for the purpose of measuring optionality risk, such as the volatility of prepayment rates or the relationship between those rates and interest rates. The measurement of basis risk will also require assumptions to be made about the variation of the ADI's customer product rates around the implied cost of funds. These types of assumptions must be clearly documented by the ADI, including reference to the data on which the assumptions rely.

Interest rate risk in the banking book capital requirement

24. An ADI's IRRBB capital requirement, as determined by its internal model, must be calculated as:
 - (a) the amount estimated for repricing and yield curve risks which is the estimated 99th percentile of EV0 minus EV1 (refer to paragraph 13 of this Attachment); plus
 - (b) the amounts estimated for basis and optionality risks as detailed in paragraphs 19 to 23 of this Attachment, except where the ADI has written approval from APRA to exclude basis and/or optionality risks; less
 - (c) any amount resulting from assumed diversification benefits between repricing and yield curve risks, basis risk and optionality risk; plus
 - (d) the embedded loss (or embedded gain if this amount is negative) which is defined as the sum of the book value of all banking book items minus EV0

subject to the capital requirement not being less than zero.

25. An ADI may only incorporate diversification benefit estimates if the ADI can demonstrate to APRA, using robust quantitative and qualitative analysis, that its correlation estimates are appropriate and take into account the uncertainty surrounding any such estimates (particularly in periods of stress).

Stress testing

26. An ADI must have in place a comprehensive and rigorous program of stress testing its internal model. Stress testing must include:
 - (a) consideration of a breakdown in the ADI's key modelling assumptions, such as its repricing assumptions; and
 - (b) scenarios based on sudden changes in the level of interest rates and changes in the slope and shape of the yield curve.
27. An ADI's policies and limits must reflect the results of stress-testing exercises and these results must be communicated to relevant senior management and the ADI's Board, or Board committee, on a regular basis.

Validation

28. An ADI must have a robust and documented system in place to validate the accuracy and consistency of its internal model. The ADI must demonstrate to APRA that its internal validation process enables it to assess the performance of its internal model in a meaningful and consistent manner. As part of the validation of its internal model, the ADI must regularly compare actual loss experience against its estimates for those losses to ensure their reasonableness.
29. An ADI must have in place a robust process for validating changes to its internal model (including information that flows into that model). This would include a systematic process for reviewing the appropriateness of modelling assumptions and for making changes to those assumptions.