



Prudential practice guide

APG 113 Capital Adequacy: Internal Ratings-based Approach to Credit Risk

June 2026

Contents

About this guide	2
Glossary	3
Introduction	6
Chapter 1 - Governance and oversight	7
Chapter 2 - Asset classes	10
Chapter 3 - Ongoing requirements	15
Chapter 4 - IRB risk-weight functions and components	16
Chapter 5 - Rating system design and operations	20
Chapter 6 - Risk quantification	27
Chapter 7 - Validation of rating systems and risk estimates	34
Chapter 8 - Recognition of collateral, and receivables	38
Chapter 9 – Initial IRB approval	41
Attachment A – IRB asset class flowchart	50
Attachment B – IRB asset class mapping.....	51
Attachment C – LGD calculation examples	54

Disclaimer and Copyright

This prudential practice guide is not legal advice and users are encouraged to obtain professional advice about the application of any legislation or prudential standard relevant to their particular circumstances and to exercise their own skill and care in relation to any material contained in this guide.

APRA disclaims any liability for any loss or damage arising out of any use of this prudential practice guide.

© Australian Prudential Regulation Authority (APRA) 2024

This work is licensed under the Creative Commons Attribution 3.0 Australia Licence (CCBY 3.0). This licence allows you to copy, distribute and adapt this work, provided you attribute the work and do not suggest that APRA endorses you or your work. To view a full copy of the terms of this licence, visit <https://creativecommons.org/licenses/by/3.0/au/>

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 113 Capital Adequacy: Internal Ratings-based Approach to Credit Risk (APS 113) sets out APRA's requirements for an authorised deposit-taking institution (ADI) that has approval to use, or is seeking approval to use, an internal ratings-based (IRB) approach to credit risk for regulatory capital purposes.

This PPG, *Prudential Practice Guide APG 113 Capital Adequacy: Internal Ratings-based Approach to Credit Risk (APG 113)*, aims to assist ADIs in complying with those requirements and, more generally, to outline prudent practices in relation to the management and measurement of credit risk. APG 113 should be read in conjunction with other relevant prudential standards and PPGs.

For capital, the relevant standards and guides include:

- *Prudential Standard APS 110 Capital Adequacy (APS 110)*;
- *Prudential Practice Guide APG 110 Capital Adequacy (APG 110)*;
- *Prudential Standard APS 112 Capital Adequacy: Standardised Approach to Credit Risk (APS 112)*;
- *Prudential Practice Guide APG 112 Capital Adequacy: Standardised Approach to Credit Risk (APG 112)*;
- *Prudential Standard APS 120 Securitisation (APS 120)*; and
- *Prudential Standard APS 180 Capital Adequacy: Counterparty Credit Risk (APS 180)*.

For risk management, the relevant standards and guides include:

- *Prudential Standard APS 220 Credit Risk Management (APS 220)*;
- *Prudential Practice Guide APG 220 Credit Risk Management (APG 220)*;
- *Prudential Standard CPS 220 Risk Management (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 113, an ADI has the flexibility to structure its business operations in the 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 size, business mix and complexity of the ADI's operations.

Glossary

ADC	Land acquisition, development and construction as defined in APS 112.
ANZSIC	Australian and New Zealand Standard Industrial Classification. A standard classification system for business activity.
ADI	Authorised deposit-taking institution as defined in the <i>Banking Act 1959</i> .
Advanced internal ratings-based (AIRB) approach	An internal ratings-based approach for corporate, sovereign and financial institution exposures that requires an ADI to provide its own estimates of probability of default, loss given default and effective maturity, and use supervisory estimates for exposure at default.
APS 110	<i>Prudential Standard APS 110 Capital Adequacy</i>
APS 112	<i>Prudential Standard APS 112 Capital Adequacy: Standardised Approach to Credit Risk</i>
APS 113	<i>Prudential Standard APS 113 Capital Adequacy: Internal Ratings-based Approach to Credit Risk</i>
APS 220	<i>Prudential Standard APS 220 Credit Risk Management</i>
ARS 230.0	<i>Reporting Standard ARS 230.0 Commercial Property</i>
Backtesting	A validation technique that compares expected values with actual values.
Board	Board of directors
CPG 235	<i>Prudential Practice Guide CPG 235 Managing Data Risk</i>
Credit conversion factor (CCF)	A factor that converts an off-balance sheet exposure into an on-balance sheet equivalent.
Credit risk mitigation (CRM)	A credit risk mitigation technique that meets the relevant requirements of APS 112 and APS 113.
Collection costs	Direct and indirect costs associated with collecting on an exposure that are not charged to the borrower.
Commercial real estate	Property that does not meet the definition of residential real estate, such as office buildings, retail space, industrial or warehouse space and hotels.
Cyclicality	The degree of responsiveness to the economic cycle.
Default	Non-performing as defined in APS 220.
Effective maturity (M)	The remaining effective term of a credit obligation.
Expected loss (EL)	The average credit loss that an ADI is expected to experience.

Exposure at default (EAD)	The gross exposure under a facility (i.e. the amount that is legally owed to an ADI) upon the default of a borrower.
Foundation internal ratings-based (FIRB) approach	An internal ratings-based approach for corporate, sovereign and financial institution exposures that requires an ADI to provide its own estimates of probability of default and effective maturity, and rely on supervisory estimates for loss given default and exposure at default.
General corporate	Corporate exposures excluding specialised lending.
Income-producing real estate (IPRE)	A method of funding for real estate where the prospects for repayment depend primarily on the cash flows generated by the asset or other real estate owned by the borrower.
Internal Capital Adequacy Assessment Process (ICAAP)	Internal Capital Adequacy Assessment Process as described in APS 110.
Internal ratings-based (IRB) approach	An internal ratings-based approach to credit risk as defined in APS 113.
IRB accreditation	The requirements for, and process of, seeking initial approval from APRA to use the IRB approach as set out in APS 113 and this PPG.
Interest rate risk in the banking book (IRRBB)	Interest rate risk in the banking book as defined in APS 117.
Loss given default (LGD)	The economic loss upon the default of a borrower.
Permanent partial use	The permanent use of the standardised approach to credit risk for business activities that are immaterial in terms of size and perceived risk profile.
Phased roll-out	The implementation of an internal ratings-based approach for material asset classes, sub-asset classes or business units in more than one phase according to a specified timetable.
Point-in-time (PIT)	A rating philosophy that seeks to produce ratings that are sensitive to the economic cycle.
Probability of default (PD)	The risk of borrower default.
Product profile transformation	Changes in a borrower's mix of borrowing and other credit-related products.
Qualifying revolving retail (QRR)	Revolving retail exposures that meet the relevant requirements of APS 113, such as credit cards.
Re-aging	Resetting the count of days past due to zero.
RBNZ	Reserve Bank of New Zealand
Residential real estate	Immovable property that has the nature of a dwelling and satisfies all applicable laws and regulations enabling the property to be occupied for housing purposes.

Risk-weighted assets (RWA)	Determined in accordance with the relevant requirements of APS 112 and APS 113.
Small and medium-sized enterprise (SME) corporate	Corporate exposures where borrowers form part of a group of connected borrowers with reported consolidated annual revenue of less than \$75 million.
Small and medium-sized enterprise (SME) retail	Small business exposures that meet the relevant requirements of APS 113 for retail regulatory capital treatment.
Supervisory slotting	An internal ratings-based approach for specialised lending exposures that requires an ADI to map its internal ratings to the supervisory slotting categories, and rely on supervisory risk-weights for the slotting categories and supervisory estimates for exposure at default.
Through-the-cycle (TTC)	A rating philosophy that seeks to consider the performance of borrowers across the economic cycle and produce ratings that are insensitive to the cycle.
Top-down approach	A rating approach for purchased receivables that permits an ADI to assign risk estimates at a pool level instead of an individual borrower level.
Unexpected Loss (UL)	Credit loss in excess of expected loss.

Introduction

- 1) APS 113 applies to an authorised deposit-taking institution (ADI) that has been approved, or is seeking approval, to use an IRB approach for the purpose of determining the regulatory capital requirement for credit risk. The main elements of the IRB approach are summarised in Table 1.

Table 1. *IRB approach – key elements*

Element	Description
Asset classification	The categorisation of exposures into asset classes with different underlying risk characteristics.
Risk components	Internal or supervisory estimates of probability of default (PD), loss given default (LGD), exposure at default (EAD) and effective maturity (M).
Risk-weight functions	Calculation methods that transform the risk components into the capital requirement for unexpected loss (UL), which is expressed in terms of risk-weighted assets (RWA).
Expected loss adjustment	A comparison of expected loss (EL) with provisions, which may result in an adjustment to capital.
Quantitative and qualitative requirements	Minimum requirements that must be met at the time of initial approval and on an ongoing basis. The requirements relate to governance and oversight, rating system design and operations, use, risk quantification and validation.

- 2) This Prudential Practice Guide (PPG) sets out good practice for an ADI using an IRB approach to credit risk. It provides guidance on governance and oversight of the ADI's rating and estimation processes, asset classes under the IRB approach, and other quantitative and qualitative requirements. Chapter 9 of this PPG also contains guidance for an ADI seeking approval to use an IRB approach in relation to the IRB application process, IRB approval expectations, and phased roll-out of an IRB approach.

Chapter 1 - Governance and oversight

This section provides guidance on APS 113 paragraphs 20-27.

- 3) APS 113 (paragraphs 20-23) details requirements relating to the role of the Board in the governance and oversight of an ADI's rating systems and risk estimates. Information provided to the Board for this purpose should be sufficient to enable directors to actively discuss and confirm, at least annually, the continuing appropriateness, effectiveness and integrity of the rating systems and risk estimates. Such information would generally include reporting from risk management as well as internal audit.
- 4) Good practice for senior management in the governance and oversight of an ADI's rating systems and risk estimates includes:
 - a) **governance**: establishing effective governance arrangements and controls for the rating systems and risk estimates. Effective governance arrangements would delineate clear roles and responsibilities for: development, implementation and use; validation; and independent review. Such arrangements would be clearly documented and include delegations of authority to approve changes to the rating systems and exceptions to policies, and reporting mechanisms to escalate issues;
 - b) **policies**: overseeing the development and implementation of policies to identify, assess and manage risks inherent in the rating systems and risk estimates, and promoting compliance with those policies;
 - c) **oversight**: providing oversight of activities across the entire lifecycle of the rating systems and risk estimates including development, implementation, monitoring, validation and use;
 - d) **resourcing**: ensuring that IRB functions are resourced appropriately. The number of resources would generally be commensurate with the volume and complexity of activities undertaken. For example, the development and validation functions would have adequate technical skills and expertise as well as an understanding of the business lines in which rating systems are used;
 - e) **incentives and culture**: establishing an appropriate incentive and organisational structure. For example, remuneration practices and risk culture would support effective challenge of the rating systems and risk estimates, and encourage critical and objective analysis. APRA expects reporting lines and incentives to be clear, with potential conflicts of interest identified and addressed; and
 - f) **independent review**: acting to ensure that comprehensive independent reviews are undertaken at least annually, and on an ad hoc basis as circumstances warrant.
- 5) A prudent ADI would establish a principal committee to provide robust governance and oversight of its rating systems and risk estimates. Good practice would be for the committee to provide challenge from different perspectives and have representation from a range of stakeholders, including senior management in risk management and business lines. The operation of the committee would generally be supported by formal and informal working groups, and challenge provided by the committee would be well documented in meeting minutes.

Model risk policy

- 6) APRA expects an ADI that uses statistical models or other mechanical methods in rating assignments and risk estimation to have a model risk policy that details robust processes for model development, validation, implementation and governance. Table 2 provides good practice for the model risk policy and associated registers.

Table 2. *Model risk policy and registers*

Model risk policy	Model register, change log and issues register
<p>Good practice is for the model risk policy to:</p> <ul style="list-style-type: none"> clearly define what constitutes a model and model risk; address each stage of the model lifecycle; outline the roles and responsibilities of relevant stakeholders in the model risk management process;¹ identify the necessary controls and processes to ensure compliance with policy, and detail how policy exceptions are managed; and include the formation of a model register, model change log and issues register. 	<p>Good practice is for the model register, model change log and issues register to:</p> <ul style="list-style-type: none"> be used actively and contribute to a robust internal process for monitoring model changes, ensuring that models evolve appropriately over time and remain fit for purpose; contain the necessary information to support effective model risk management;² be centralised in order to facilitate an aggregate view of the models in use; be kept up to date, and reconcile closely with regulatory reporting and disclosure; and be available to APRA upon request.

Independent review

- 7) APS 113 (paragraph 27) details requirements relating to the independent review of an ADI's rating systems and operations by internal audit or a similar independent function. The objective of the independent review is to assess the overall adequacy and effectiveness of the risk management framework for internal rating systems and risk estimates, and the ADI's compliance with APS 113.
- 8) In meeting this objective, the internal audit function would typically map the minimum APS 113 requirements to its audit reviews, and establish an audit plan that specifies the requirements that are to be reviewed annually and the requirements to be covered over a longer cycle. High risk items would be reviewed more regularly and a deep dive of all aspects would be undertaken at least every three years.
- 9) On an annual basis, the internal audit function would usually collate audit findings relevant to APS 113 to provide a holistic view of the effectiveness of the ADI's rating systems and risk estimates for relevant

¹ For example, the model owner would have ultimate accountability for the use and performance of a model, which includes ensuring that the model is developed, implemented and used properly, has undergone the appropriate validation and approval processes, and is documented comprehensively.

² For example, the model register would typically include details about the type of model, model scope, IRB asset class, model materiality (including total exposure), model owner, implementation date, validation rating and dates of the most recent and next scheduled validations.

stakeholders, including the Board and senior management. This would include a summary of audit reviews, action plans and the status of audit findings. APRA expects that material issues would be promptly escalated by internal audit and rectified by the ADI.

10) Reviews that would typically be undertaken by the internal audit function include:

- a) evaluating the overall effectiveness of the development, validation and governance functions. For example, a review of the validation function could assess whether that function is resourced appropriately and provides meaningful independent challenge of an ADI's rating systems and risk estimates. However, internal audit would not be expected to duplicate the activities of the validation function;
- b) assessing the adequacy of relevant policies and the ADI's compliance with those policies. This could include an assessment of whether approval and change control processes are being followed adequately, validation is being conducted in a timely manner, and issues and exceptions are being escalated appropriately;
- c) examining the design and effectiveness of internal controls and processes that are intended to ensure compliance with APS 113; and
- d) assessing the adequacy, consistency and completeness of documentation and reporting. This could include an assessment of the accuracy and completeness of the model and issues registers.

Chapter 2 - Asset classes

This section provides guidance on APS 113 paragraphs 28-41 and Attachment A paragraphs 6-7.

11) APS 113 (paragraph 28) requires an ADI to assign its credit exposures to different IRB asset classes according to certain criteria. The following principles and case studies aim to assist with asset classification for certain exposures.

Table 3. Summary of IRB asset classes

Asset class	Description
Corporate	All credit exposures to corporate counterparties and public sector entities, including exposures within the four specialised lending sub-asset classes of project finance, object finance, commodities finance and income-producing real estate (IPRE).
Sovereign	All credit exposures to sovereign counterparties, as defined in APS 112.
Financial institution	All credit exposures to financial institution counterparties, as defined in APS 113.
Retail	Any exposure that is extended to an individual or individuals and forms part of a large pool of exposures that is managed by the ADI on a pooled basis. ³

Corporate exposures

Income-producing real estate

- 12) APS 113 (paragraph 31) defines income-producing real estate as a method of funding for real estate where the prospects for repayment depend primarily on the cash flows generated by the asset or other real estate owned by the borrower. Real estate assets include office buildings to let, retail space, residential buildings, industrial or warehouse space, hotels and land.
- 13) The primary source of cash flows for IPRE exposures would generally be lease or rental payments, or the sale of the asset. The borrower might, but need not necessarily be, a special purpose vehicle, an operating company focused on real estate construction or holdings, or an operating company with sources of revenue other than real estate.
- 14) An exposure to a borrower whose primary business is real estate investment or development would usually be classified as IPRE irrespective of the purpose of the exposure because the primary source of income and risk for such a borrower is the property market. That is, for a real estate borrower, transactional banking exposures

³ Small-business exposures or exposures secured by residential real estate, whether or not extended to an individual, may be classified as retail exposures where they satisfy the criteria in APS 113 (paragraphs 37 or 40).

such as credit cards, overnight overdraft facilities and short-term working capital facilities would be treated as IPRE in addition to property exposures.

- 15) An exposure for real estate investment or development purposes where the primary source of debt servicing and repayment is real estate income would generally be classified as IPRE even if the borrower is a non-real estate borrower, such as a manufacturing company.
- 16) An exposure for which non-real estate income is sufficient to either predominantly or fully service the credit obligation would not usually meet the definition of general corporate, unless non-real estate income is also the primary source of income and debt servicing.
- 17) The presence of non-real estate collateral (such as cash collateral) would not usually be sufficient to classify an exposure as general corporate.
- 18) An exposure is not required to be classified as IPRE where it meets certain criteria in APS 113 (paragraph 32). One requirement is that the borrower has more than \$250 million in tangible assets to which the ADI has unconditional recourse. Directors' personal assets and simple debenture charges taken for 'makeweight' purposes would not count towards the borrower's assets for this purpose. Another requirement is that real estate assets are sufficiently diversified and not concentrated in one particular specific geographic location. Asset concentrations in an individual major central business district are considered sufficiently diversified to meet this requirement.
- 19) An exposure for which rural property has been acquired specifically for lease or resale would not generally be classified as IPRE where:
 - a) an ADI satisfies itself that the exposure can be serviced appropriately on a principal-and-interest basis over a commercial term, by looking through any lease arrangement to the underlying productive capacity of the rural property based on normal seasonal conditions; and
 - b) the exposure and its valuation are considered by an agricultural lending specialist team, rather than a commercial property specialist team, should any such teams be in place at the ADI.
- 20) The classification of an exposure as IPRE or general corporate is expected to be strongly aligned to the reporting classification under *Reporting Standard ARS 230.0 Commercial Property (ARS 230.0)*, rating tool or model used, and Australian and New Zealand Standard Industrial Classification (ANZSIC) code assigned. Any material differences would be well supported.
- 21) The classification of an exposure as IPRE or general corporate would usually be reassessed upon new or additional lending.

Large corporate

- 22) In determining whether an exposure meets the definition of large corporate in APS 113 (paragraph 14(p)), an ADI must consider the audited financial statements of the corporate counterparty or, where the corporate counterparty is part of a group, the audited financial statements of the group. For this purpose, 'group' refers to the entities in a group to which the ADI has recourse. That is, the ADI may use consolidated (special purpose) financial statements representing the entities in the group to which it has recourse.

SME corporate

- 23) SME corporate exposures are corporate exposures where borrowers form part of a group of connected borrowers with reported consolidated annual revenue of less than \$75 million to which the firm-size adjustment in APS 113 (Attachment A, paragraph 6) applies. In determining consolidated annual revenue:
- a) an ADI would sum the revenue of all entities in a connected borrower group to which it has recourse. Transactions between entities in the group may be netted off for this purpose;
 - b) where EAD is greater than or equal to \$5 million, revenue would be based on the average amount calculated over the prior three years, or the latest amount updated at least every three years;
 - c) where EAD is less than \$5 million:
 - i) revenue could be based on information obtained at the time of origination or refinancing. However, better practice is to update revenue on an ongoing basis and use the average amount calculated over the prior three years or the latest amount updated at least every three years; and
 - ii) the ADI may use sources other than financial statements to determine revenue; and
 - d) in limited circumstances where revenue data is not available, the ADI must use the minimum firm-size values in APS 113 (Attachment A, paragraph 7) for asset classification and risk-weighting purposes. The minimum firm-size values are based on the EAD of the connected borrower group. The treatment in APS 113 (Attachment A, paragraph 7) would be applied on an exceptions basis only.

Public sector entities

- 24) For public sector entities that do not have specific revenue-raising powers (such as agencies, statutory authorities and bodies created to enable legislation), consolidated annual revenue should be set equal to the minimum value of \$7.5 million, as detailed in APS 113 (Attachment A, paragraph 6), for asset classification and risk-weighting purposes. This means that such entities would be classified as SME corporate and obtain the full benefit of the firm-size adjustment in APS 113 (Attachment A, paragraph 6).
- 25) For all other public sector entities, the reported consolidated annual revenue would be used for asset classification and risk-weighting purposes. Where revenue data is unavailable, the minimum values in APS 113 (Attachment A, paragraph 7) must be used.

Retail exposures

Retail residential mortgage

- 26) To be classified as a retail residential mortgage exposure under APS 113 (paragraph 37), the exposure cannot be for business purposes. In this context, an exposure would not usually be assessed as being for business purposes if it is provided wholly or predominantly:
- a) for personal, domestic or household purposes; or

- b) to purchase, renovate or improve residential real estate for investment purposes, or to refinance credit previously provided for this purpose.
- 27) An ADI may treat a mortgage over a lease of crown land as a retail residential mortgage exposure provided that all other eligibility criteria in APS 113 (paragraph 37) are met.
- 28) APS 113 (Attachment A, paragraph 14) requires an ADI to separately identify retail residential mortgage exposures to borrowers that have mortgaged five or more investment properties. For this purpose:
- a) properties mortgaged with the ADI as well as other lenders would be taken into account;
 - b) where a borrower has a joint property with another party, it would count as one property for that borrower;
 - c) where the ADI has a joint exposure to two or more borrowers, the highest property count of the individual borrowers would be used to determine the risk-weight for that exposure. Table 4 provides an illustrative example of how properties would be counted for risk-weighting purposes;
 - d) information on the number of properties would be obtained at least at the time of origination or refinancing;
 - e) for complex lending relationships, including those where an individual may hold investment properties both as trustee for a trust and in their own right, ADIs are expected to assess any interdependency (or interconnectedness) in line with the relevant credit policies and consider if properties should be aggregated; and
 - f) for exposures that were originated or refinanced before 1 January 2023 or the IRB accreditation date (whichever is later), it may be reasonable to conclude that APS 113 (Attachment A, paragraph 14) does not apply where the ADI:
 - i) checks that the borrower has less than five mortgaged properties with the ADI itself; and
 - ii) does not have any other information to suggest that the borrower has five or more mortgaged investment properties overall.

Table 4. Illustrative example of counting properties

Scenario	Exposure	Property count	Scaling factor for risk-weighting purposes
Borrower A has four investment properties and a joint investment property with borrower B. Borrower B also has two other investment properties.	Exposures to borrower A	$4 + 1 = 5$	2.5
	Exposures to borrower B	$2 + 1 = 3$	1.7
	Joint exposure to borrowers A and B	$\text{Max}(5, 3) = 5$	2.5

- 29) APRA expects that some exposures to borrowers with multiple investment properties would be more appropriately managed as corporate (including IPRE) exposures. An ADI would have effective criteria in place to identify and monitor those exposures. Such exposures would not be eligible for retail classification nor capital treatment.

Qualifying revolving retail

- 30) To be classified as a QRR exposure under APS 113 (paragraph 38), the exposure cannot be for business purposes. An exposure would not usually be assessed as being for business purposes if it meets the criteria in paragraph 26) of this PPG.
- 31) APS 113 (paragraph 39) defines a QRR transactor as a borrower that has repaid the balance of their facility in full at each scheduled repayment date for the previous 12 months. A QRR transactor would not generally include a borrower that:
- a) pays the minimum repayment amount, rather than the full outstanding balance at the statement date; or
 - b) has taken up a zero interest balance transfer offer.

SME retail

- 32) APS 113 (paragraph 40) requires an ADI to identify the consolidated annual revenue for a group of connected small-business borrowers to determine SME retail eligibility. For this purpose:
- a) the guidance in sub-paragraphs 23(a) and (c) of this PPG would apply; and
 - b) in limited circumstances where revenue data is not available, an ADI may still reasonably form the view that revenue is less than \$75 million, and therefore the exposure may be classified as SME retail provided that all other eligibility criteria in APS 113 (paragraph 40) are met. This treatment would be applied on an exceptions basis only.
- 33) To be classified as a SME retail exposure under APS 113 (paragraph 40), both the borrower and exposure must be non-complex. An ADI would document its definition of complexity for this purpose. Complexity could be defined based on various factors, including product type, borrower type and level of risk.

Chapter 3 - Ongoing requirements

This section provides guidance on APS 113 paragraphs 52-56.

- 34) APRA expects an ADI to attest annually that it continues to meet the minimum requirements of APS 113. This would typically be provided by an accountable person of the ADI. To support the attestation, a prudent ADI would have an effective APS 113 compliance framework and process in place. The effectiveness of the compliance framework and process would be reviewed periodically.
- 35) To ensure it remains in compliance with APS 113, a prudent ADI would keep APRA fully informed of changes to rating systems, risk estimates and modelling assumptions. The ADI would, in consultation with APRA, determine which changes are material and would require prior approval by APRA under APS 113 (paragraph 52). As a general principle, the ADI should take a conservative approach by classifying changes as material unless otherwise agreed with APRA. APRA expects that an ADI would seek formal approval from APRA only after undertaking internal validation and governance processes.
- 36) To support changes to rating systems, risk estimates or modelling assumptions, an ADI would usually provide the supporting information outlined in Table 5. In all cases, relevant documentation would be submitted to APRA prior to the implementation of the changes.

Table 5. Supporting information for changes

Changes requiring prior approval from APRA	Other changes
<ul style="list-style-type: none"> • A cover letter outlining the details of the change, rationale, intended implementation date and indicative RWA impact • Development documentation • Validation documentation • The relevant governance committee paper 	<ul style="list-style-type: none"> • A cover letter outlining the details of the change, rationale, intended implementation date and indicative RWA impact • The relevant governance committee paper

- 37) For an overseas banking subsidiary that is prudentially regulated by the Reserve Bank of New Zealand (RBNZ), an ADI is not expected to obtain prior approval from APRA for changes to internal rating systems, risk estimates and modelling assumptions where these are exclusively for exposures of that subsidiary and comply with RBNZ requirements relating to model approval. However, APRA would still expect to be notified of any changes prior to implementation. Such notification would include details of the change, the rationale, intended implementation timing, indicative RWA impact and any approval conditions imposed by the RBNZ.
- 38) APRA expects an ADI to monitor specific non-material changes to its rating systems and risk estimates that, in aggregate or over time, may have a material cumulative effect.

Chapter 4 - IRB risk-weight functions and components

This section provides guidance on APS 113 Attachments A and B.

39) APS 113 requires an ADI to apply certain risk-weight functions or risk-weight schedules, and quantify certain credit risk components, to calculate RWA for UL for various asset classes. The credit risk components include PD, LGD, EAD and M.

IRB RWA scaling factor for exposures of a New Zealand subsidiary

40) APS 113 (paragraph 13) requires ADIs to not apply the RBNZ scaling factor for the purpose of calculating Level 2 Regulatory Capital requirements, with ADIs instead required to apply a scaling factor of 1.1. APRA expects the scope of the 1.1 scaling factor for exposures of a New Zealand subsidiary to be applied consistently with the approach set out in the RBNZ's prudential rules. For example, the 1.1 scaling factor would apply to RWA for New Zealand exposures subject to supervisory slotting.

Supervisory slotting approach for specialised lending

41) Where specialised lending exposures are subject to the supervisory slotting approach, APS 113 (Attachment A, paragraph 9) requires an ADI to map its internal ratings to the slotting categories. Each slotting category broadly corresponds to a range of external credit rating grades as detailed in Table 6.⁴

Table 6. *Mapping of slotting categories to external credit rating grades*

Slotting category	Strong	Good	Satisfactory	Weak
External credit rating grade	BBB- or better	BB+ or BB	BB- or B+	B to C-

42) Where an ADI applies a two-dimensional mapping approach that takes both PD and LGD into account, the LGD estimates used in the mapping would be calibrated to economic downturn conditions.

Loss given default estimates

43) For the purposes of assigning LGD estimates to subordinated debt, APS 113 (Attachment B, paragraph 13) requires an ADI to have a policy that defines subordination, including economic subordination. APG 112

⁴ This also corresponds to any broadly equivalent credit grade across external credit assessment institutions.

provides guidance on indicators of subordination. In developing a policy on subordination, an ADI may choose to include materiality thresholds that trigger subordination.

- 44) For senior exposures to borrowers that satisfy the criteria in APS 113 (Attachment B, paragraph 10):
- a) the foundation IRB (FIRB) LGD in APS 113 (Attachment B, paragraph 10) and the advanced IRB (AIRB) LGD in Attachment B, paragraph 12, are applicable to domestic infrastructure or utilities only. Offshore infrastructure or utilities would be treated in the same manner as other senior unsecured exposures;
 - b) to calculate the LGD under the FIRB approach for a partially secured exposure in accordance with APS 113 (Attachment B, paragraph 16), LGD_U would be set equal to the LGD in Attachment B, paragraph 10; and
 - c) the concession, right to operate or the asset-owning entity and shares thereof would not be treated as other eligible physical collateral under the FIRB approach nor as other physical collateral for the purpose of the LGD floor calculation under the AIRB approach.
- 45) For covered bond exposures, where cover pools comprise residential or commercial property exposures, an ADI would use the FIRB LGD applicable to eligible residential or commercial real estate in APS 113 (Attachment B, paragraph 14) for risk-weighting purposes.
- 46) Where covered bonds are provided as collateral for an exposure, covered bonds would be treated as eligible financial collateral under the FIRB approach and as financial collateral for the purpose of LGD floor calculation under the AIRB approach.
- 47) Where APS 113 requires an ADI's LGD estimates to be subject to an LGD floor, the floor would usually be applied at the same level at which the estimates are assigned. For example, if LGD is assigned at a borrower level, the LGD floor would also be applied at the borrower level. The LGD floor would be calculated as the weighted average across collateral types.
- 48) For the purpose of the LGD floor calculation under the AIRB approach in APS 113 (Attachment B, paragraph 19), where an exposure is secured by a general security agreement over collateral, an ADI may look through to the underlying collateral and apply the relevant floor values. Where the ADI chooses not to look through to the underlying collateral, the general security agreement would be treated as 'all other collateral' for the floor calculation.
- 49) An ADI may treat a mortgage over a lease of crown land as residential or commercial real estate for the purposes of the LGD calculation under the FIRB approach and LGD floor calculation under the AIRB and retail IRB approaches.

Exposure at default estimates

- 50) APS 113 (Attachment B, paragraph 33) allows an ADI to apply credit conversion factors (CCFs) to the lower of the value of the unused committed credit line and the value of any other constraining factor on the availability of the facility. The constraining factor would be written explicitly into the facility documentation and processes would exist to check the constraint prior to approving drawdowns.
- 51) Conditions precedent, as defined in APS 112 (Attachment C, paragraph 2), would not generally be recognised as constraining factors.

- 52) Constraining factors may include the existence of a ceiling on the potential lending amount that a borrower can draw down based on the borrower's reported cash flow, external rating, maximum allowable loan-to-valuation ratio or collateral securing the exposure. However, exposures that are drawn in stages according to a pre-arranged schedule (such as construction loans) would be excluded from such treatment.
- 53) In the case of seasonal facilities, where an overdraft limit varies in size based on the period of the year, the CCF may be applied to the lower committed available amount during the period that the funding is restricted. When the funding is no longer restricted by the time period, the CCF would be applied to the ordinary or higher amount.

Use of proxy values for risk components

- 54) A prudent ADI would have sound business and data management practices to minimise the extent to which proxy values are used in the regulatory capital calculation.
- 55) In exceptional circumstances, such as where risk estimate data is missing, a prudent approach would be to apply the following estimates:
- a) for PD, the PD estimate corresponding to the highest (non-defaulted) PD grade or pool;
 - b) for LGD, the LGD estimate corresponding to the highest LGD grade or pool or, where LGD is not eligible to be modelled, the applicable supervisory estimate;
 - c) for EAD, the limit of the exposure or, where EAD is not eligible to be modelled, the applicable supervisory estimate; and
 - d) for M, 5 years.
- 56) Where there is doubt about the enforceability of collateral due to inadequate controls or processes, the exposure would be treated as unsecured for regulatory capital purposes.

Treatment of guarantees and credit derivatives

- 57) APS 113 (Attachment B, paragraph 49) does not permit the application of credit risk mitigation (CRM) to reflect the effect of double default, nor result in an adjusted risk-weight that is less than that of a comparable direct exposure to the guarantor or credit protection provider. This means that:
- a) rating criteria, rating processes and risk estimates would not take into consideration any favourable effects of imperfect correlation between default events for the borrower and guarantor or credit protection provider; and
 - b) for the purpose of determining the risk-weight floor, regardless of the nature of the underlying exposure, a comparable direct exposure to the guarantor or credit protection provider is an unsecured claim on the guarantor or credit protection provider; however, an ADI may take the seniority and collateralisation of the guarantee or credit derivative into account where applicable. For example, if the guarantor or credit protection provider pledges collateral, the ADI may reflect that collateral in the LGD used to determine the risk-weight for a comparable direct exposure. In the case of asset finance exposures with a parental guarantee, the ADI may choose to rate the borrower as part of a group, if appropriate, based on

consolidated financial statements (instead of applying PD substitution) and reflect the collateral provided by the borrower in the LGD. The treatment of entities in a connected group for rating purposes would be consistent with the ADI's policy as per APS 113 (Attachment D, paragraph 44).

- 58) An ADI may choose not to recognise CRM if doing so would result in a higher capital requirement.
- 59) Under the FIRB substitution approach, APS 113 (Attachment B, paragraph 53) permits an ADI to replace the LGD of the underlying exposure with the LGD applicable to the guarantee or credit derivative, taking the seniority and collateralisation of the guarantee or credit derivative into account. For example:
- where the ADI has a subordinated claim on a borrower but has a guarantee that represents a senior claim on the guarantor, it may determine the risk-weight of the covered portion based on the PD of the guarantor and an LGD applicable to a senior exposure instead of subordinated debt; and
 - where an exposure is guaranteed by a sovereign counterparty, the ADI may reflect the risk-mitigating effect of the guarantee by replacing the PD and LGD of the underlying exposure with the PD and LGD of the sovereign.
- 60) Table 7 provides two examples of how guarantees would be recognised with LGD substitution.

Table 7. Illustrative examples of LGD substitution

Guarantor		Sovereign rated AA	Financial institution
Exposure amount (assume that the exposure is subordinated)	Total	200	200
	Of which: Covered	100	100
Covered portion (assume that the guarantee represents a senior claim on the guarantor and is secured by other eligible physical collateral)	Collateral value post-haircut	40	40
	LGD	min [5%, (40/100)*25% + (60/100)*5%] = 5%	min [50%, (40/100)*25% + (60/100)*50%] = 40%
Uncovered portion	LGD	75%	75%
Total exposure	LGD	(100/200)*75% + (100/200)*5% = 40%	(100/200)*75% + (100/200)*40% = 58%

Chapter 5 - Rating system design and operations

This section provides guidance on APS 113 Attachment D paragraphs 4-68.

- 61) A prudent ADI would ensure that the development of its rating systems is underpinned by logic, conceptual soundness, robust statistical (or other) methods and human judgement, and is aligned with the intended use and business need.
- 62) APRA expects the design and logic underlying the rating systems to be supported by sound industry practice and published research. Qualitative adjustments and judgements would be made in an appropriate manner and clearly documented. Business insights and feedback from users would usually be considered in the development process.
- 63) A prudent ADI would undertake a rigorous assessment of the relevance and quality of data underpinning its rating systems. Any data proxies used in rating system development would be identified, justified and, where appropriate, adjusted.
- 64) Good practice in the development of an ADI's rating systems would include comprehensive testing of the effective functioning of the rating systems on an overall basis as well as for underlying components. A range of quantitative and qualitative tests would be undertaken to assess accuracy, robustness, stability, key assumptions, limitations and performance over a range of input values and scenarios.
- 65) APRA expects an ADI to mitigate weaknesses and limitations in the rating systems through conservative adjustments and other compensating controls. This is intended to ensure that the rating systems can be used effectively over a sustained period without the need for remediation or redevelopment.
- 66) APRA expects the documentation of an ADI's rating systems to be sufficiently detailed to enable independent parties (including APRA supervisors) to understand and validate the rating systems, and replicate the development process. The documentation would generally address each step of the development process and outline the methodologies employed, underlying assumptions and logic, segmentation, data sources and proxies, judgement and qualitative adjustments, testing activities, and weaknesses and limitations. The documentation would be kept up to date as the rating systems and operating environment change.

Rating philosophy

- 67) The rating philosophy of an internal rating system reflects its rating criteria and risk drivers, and influences the cyclicity or responsiveness of internal ratings and risk estimates to the economic cycle.
- 68) There is a spectrum of rating philosophies between a:
 - a) through-the-cycle (TTC) rating philosophy, which seeks to consider the performance of borrowers across the economic cycle and produce ratings that are insensitive to the cycle; and

- b) point-in-time (PIT) rating philosophy, which seeks to produce ratings that are sensitive to the economic cycle.
- 69) Most internal rating systems are usually a hybrid of TTC and PIT rating philosophies. The degree to which rating philosophies are more TTC or PIT in nature may differ for different rating processes and portfolio segments within an ADI.
- 70) APRA expects an ADI to analyse and thoroughly understand its rating philosophies. A prudent ADI would consider the implications of particular rating philosophies when designing internal rating systems and interpreting validation results.
- 71) A prudent ADI would avoid excessive procyclicality in the design of its rating systems, which may otherwise amplify economic cycles. Cyclicity would typically be assessed qualitatively and supported by quantitative analysis. In seeking to dampen excessive procyclicality, an ADI would recognise that there is a trade-off with risk sensitivity and strike an appropriate balance between the two objectives.
- 72) Good practice would be to:
- a) include TTC inputs that seek to dampen excessive procyclicality;
 - b) avoid PIT inputs that contribute to excessive procyclicality and volatility (such as simple delinquency measures and other behavioural characteristics with short-term prediction horizons); and
 - c) include PIT inputs that contribute to timely and accurate recognition of risk.
- 73) An ADI should take care not to confuse rating philosophy with calibration. Calibrating PIT ratings or PIT PD estimates to a long-run average default rate would not usually result in TTC ratings or TTC PD estimates.

Rating system operations

- 74) APS 113 (Attachment D, paragraph 44) requires an ADI to separately rate each legal entity to which it is exposed. For this purpose, a legal entity is a borrower.
- 75) In reference to the integrity of the rating process set out in APS 113 (Attachment D, paragraphs 45 to 47), APRA expects appropriate controls to be applied around the business function approval of ratings. Better practice is for:
- a) rating inputs to be completed by the relevant analyst or support function and not the individual approving the rating;
 - b) no overrides or adjustments to improve any system generated ratings to be approved by business functions; and
 - c) ratings generated using projected or limited financials to be approved by suitably qualified personnel that are independent from the business function.
- 76) APRA expects that an ADI would ensure that effective processes and controls are in place to facilitate the operational integrity and consistency of internal ratings. The ability of the ADI's rating systems to rank risk consistently through time would typically be enhanced by greater specificity and objectivity of rating criteria, and controls over the integrity of inputs and their conversion into outputs. Consistency through time would not

preclude changes due to improvements in methodologies and processes. The ADI would consider the consistency of ratings around portfolio boundaries.

77) APS 113 (Attachment D, paragraphs 46-47) requires an ADI to review and refresh the assignment of borrower and facility ratings at least annually, and have an effective process for obtaining and updating information on the borrower's financial condition and other relevant aspects. The level of analysis and information needed for those purposes would usually vary across different types of borrowers.

78) While the consideration of financial statements remains an important part of credit risk management, for SME corporate exposures, an ADI could use alternative data or a more automated process to assign and review borrower ratings and refresh risk estimates. In such circumstances, good practice is to adopt the following principles:

- a) **robust risk measurement:** the onus is on the ADI to demonstrate that the use of alternative data or a more automated process:
 - i) considers a broad range of relevant information;
 - ii) provides timely and meaningful differentiation of risk on an overall basis and across key borrower segments, including industry, exposure size and borrower type (for example, existing customers seeking new or additional lending);
 - iii) provides similar or improved risk predictions when compared with the use of financial statements or a manual rating process;
 - iv) is underpinned by robust data quality (both in terms of the data used when developing the rating system or process, and as inputs to the ratings); and
 - v) allows for borrower data to be aggregated effectively;
- b) **scope and exclusions:** the role of financial statements and rigour of assessment become more important as exposure size, borrower size, complexity and/or risk increases. The ADI would usually consider carve-outs to the use of alternative data or a more automated process on the basis of those factors. At a minimum, new-to-bank borrowers and borrowers with total business-related exposure above \$5 million would be out of scope. For the avoidance of doubt, corporate borrowers with consolidated annual revenue of \$75 million or more would also be out of scope;
- c) **human judgement and oversight:** it is prudent practice for the rating system or process to allow for the possibility of human judgement and oversight to be reflected in rating assignments where necessary (such as by way of overrides). This could include circumstances where material new information comes to light that might not otherwise be reflected in the rating. A prudent ADI would separately track the exercise of human judgement and oversight in the rating process; and
- d) **prior APRA approval:** changes to a rating system or process used to review or refresh internal ratings would usually require prior approval from APRA under APS 113 (paragraph 52).

79) Any underlying assumptions, weaknesses and limitations of an ADI's rating systems would typically be communicated to users in relevant policies and procedures, training or other mechanisms, to prevent inappropriate use.

80) A prudent ADI would ensure that new rating systems and changes to existing rating systems are implemented properly and in a timely manner.

Management of rating system underperformance

81) APRA expects an ADI to ensure that deterioration in the performance of its rating systems is identified and remediated proactively and in a timely manner. Remediation could include tactical actions (including temporary overlays or calibration adjustments) and strategic actions.

82) Where rating system underperformance relates to an underestimation of risk, an ADI would ensure that remedial action is implemented as soon as practicable. This would typically be within six months of the issue being identified (such as when the relevant governance committee agrees that an issue exists).

83) Where remedial action takes the form of a permanent change to an ADI's rating systems or risk estimates, prior approval would usually be required from APRA under APS 113 (paragraph 52). APRA expects the ADI to submit relevant documentation detailing the change within four months of the issue being identified, to allow time for review and approval.

84) Where remedial action takes the form of a temporary overlay or adjustment to an ADI's rating systems, risk estimates or capital requirement, APRA expects that:

- a) the overlay would generally be implemented once it is agreed by the relevant decision maker or governance committee of the ADI. APRA expects to be notified when an overlay is agreed, and may challenge the nature and size of the overlay after it is implemented;
- b) the size of the overlay would usually be no less than the estimated shortfall in the capital requirement;
- c) the adequacy of the overlay would be reviewed at least annually;
- d) the ADI would take appropriate actions to facilitate the removal of the overlay in a timely manner;
- e) the ADI would typically seek approval from APRA prior to removing or reducing any overlays, including those implemented proactively by the ADI or determined by APRA. An overlay that naturally varies in size (such as a risk-weight floor) 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; and
- f) the ADI would maintain a register of all overlays including those implemented proactively by the ADI or determined by APRA. The register would usually contain, at a minimum, the affected rating systems or models, a description of the issue and the size of the overlay (such as the 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.

85) A prudent ADI would discuss with APRA whether, and if so how, to disclose any material adjustments to 'Pillar 1' RWA requirements in public financial and regulatory reporting. Further guidance is provided in APG 110 (paragraph 10).⁵

⁵ The Basel framework for capital rests on 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.

Data maintenance

- 86) APS 113 (Attachment D, paragraphs 52 to 64) details requirements relating to data maintenance. In meeting these requirements, good practice includes:
- a) **governance:** having a robust and well-embedded data governance and accountability framework with clearly delineated roles and responsibilities. Business lines would be held accountable for data quality;
 - b) **data lineage, flows and controls:** being able to comprehensively map and document end-to-end data lineage, flows and controls for critical data elements. Controls are expected to be assessed as being effective;
 - c) **reporting:** establishing regular reporting on the quality of critical data elements across a range of dimensions. Data quality measurement and reporting would be reviewed regularly and improved where necessary. A consistent approach to reporting would generally be implemented across the ADI; and
 - d) **issue management:** ensuring that there is timely identification and remediation of data quality issues. The impact of such issues on the rating systems and risk estimates would be quantified. The risk estimates would usually include a margin of conservatism where data is less satisfactory. For example, missing data would be treated in a manner that would incentivise adequate data capture.

Wrong-way risk

- 87) APS 113 (Attachment D, paragraph 44) requires an ADI to have procedures in place to identify, monitor and control cases of specific wrong-way risk. This is expected to begin at the inception of a trade, and continue through the life of the trade.
- 88) APRA expects an ADI with significant exposure to counterparty credit risk to have processes in place to identify general wrong-way risk. An ADI is exposed to general wrong-way risk if the probabilities of counterparty defaults are correlated with general market risk factors, such that there may be adverse economic factors influencing many counterparties at once rather than being specific to a single counterparty. For example, if the ADI enters into an interest rate swap to pay a fixed rate and receives a variable rate from counterparties adversely exposed to increasing interest rates, an increase in interest rates will both increase exposure and increase the likelihood of counterparty default.
- 89) General wrong-way risk could be identified by the use of stress testing and scenario analyses, designed to measure the potential for increased exposure due to changes in risk factors that are positively correlated with counterparty creditworthiness. Such stress testing would address the potential impact of severe shocks occurring when relationships between risk factors have changed.
- 90) Good practice is for general wrong-way risk to be monitored by product, region, industry or other categories that are relevant to the business. A prudent ADI would provide reports to senior management on a regular basis that communicate wrong-way risks and the steps that are being taken to manage those risks.

Stress tests in the assessment of capital adequacy

- 91) APS 113 (Attachment D, paragraph 65) requires an ADI to identify possible events or future changes in economic conditions that could have unfavourable effects on its credit exposures, for the purposes of its internal assessments of capital adequacy. Examples of scenarios that could be considered are economic or industry downturns, market risk events and liquidity conditions.
- 92) APS 113 (Attachment D, paragraph 66) requires an ADI to consider the effect of mild recession scenarios when stress-testing its capital adequacy. For example, the ADI could use two consecutive quarters of zero economic growth to assess the effect on the assigned PD, LGD and EAD estimates, taking its level of international diversification into account on a conservative basis (that is, by not assuming or modelling lower losses as a result of diversification).
- 93) The ADI would generally need to consider a wide range of sources when informing, or testing, the adequacy of its stress testing approach. Such sources would include:
- a) internal evidence on the migration of the ADI's credit ratings in economic downturns;
 - b) information about the extent to which the impact of a small deterioration in the credit environment on internal ratings might provide some indication of the likely effect of more severe stress circumstances; and
 - c) relevant external evidence on ratings migration.
- 94) Where an ADI operates in several markets, it does not need to test for stress conditions in all of those markets. However, the ADI would stress test portfolios containing the majority of its exposures.

Use of internal ratings

- 95) APS 113 (Attachment D, paragraph 67) requires an ADI to use its rating systems and risk estimates for various internal purposes and not solely in the regulatory capital calculation. The main objective of the use requirement is to promote adequate incentives for ensuring the accuracy, robustness and timeliness of the IRB estimates. This would occur through meaningful internal challenge arising from the use of the estimates for internal purposes. Three main areas where the use of the IRB estimates would generally be observable are strategy and planning processes, credit exposure measurement and credit risk management, and reporting.
- 96) An ADI might not use exactly the same rating systems and risk estimates for regulatory capital and all internal purposes. In this case, the use requirement would be considered as being met if the ADI is able to demonstrate that the rating criteria, risk drivers, methodologies and/or data sources used internally for broader strategy and risk management are consistent with those used for regulatory capital purposes.
- 97) Practices that would not generally satisfy the use requirement include the following:
- a) the ADI has little or no internal incentives for ensuring the quality of the estimates and underlying rating systems;
 - b) a deterioration in the accuracy, robustness and timeliness of the IRB estimates is unlikely to be identified by the ADI's internal processes;
 - c) the IRB estimates are based on insufficient or lower quality data than that used for internal purposes;

- d) the ADI lacks a process for the continuous improvement of the IRB estimates; and
- e) the methodologies and data that underpin the IRB estimates are inconsistent with the ADI's internal approach to measuring credit risk.

Chapter 6 - Risk quantification

This section provides guidance on APS 113 Attachment D paragraphs 69-102.

- 98) Good practice for risk quantification is to ensure that the population of exposures represented in the data, the lending standards used when the data were generated, and other relevant characteristics match closely, or are at least comparable, with an ADI's current exposures and lending standards.
- 99) An ADI would normally be able to demonstrate that the economic or market conditions underlying the estimation data are relevant to current and foreseeable conditions, and that the number of exposures in the sample and the data period used for quantification are sufficient to provide the ADI with confidence in the accuracy and robustness of its estimates. The estimation technique used would perform well in out-of-sample tests.
- 100) APS 113 (Attachment D, paragraph 71) requires an ADI to add a margin of conservatism to its risk estimates where appropriate. This is intended to ensure that the ADI identifies and addresses potential (downward) biases, inaccuracies and uncertainties in its risk estimates. Those biases and uncertainties might relate to the relevance and quality of development datasets, estimation processes, and amount and nature of judgement used.
- 101) Margins of conservatism could be implemented through adjustments to inputs, calculations and/or outputs, and could be based on quantitative or qualitative assessments. The larger the biases or uncertainties, the larger the margin of conservatism that is expected to be applied. An ADI would usually have a policy that addresses and promotes the use of conservatism in a consistent and robust manner where appropriate, and would be able to substantiate the conservatism of its risk estimates.

Definition of default

- 102) APS 113 (Attachment D, paragraph 72) requires an ADI to use the reference definition of default detailed in APS 220 for the purposes of recording defaults and estimating PD, LGD and EAD. APRA expects the ADI to use a consistent definition of default for all relevant purposes including risk estimation, monitoring, validation, regulatory reporting and disclosure.
- 103) Variations to the reference definition of default could be considered for estimation purposes (such as creating additional default observations); however, such variations would be clearly identified, and adjustments made to achieve broad equivalence with the reference definition as part of the overall estimation process. The total number of defaults is expected to be consistent across PD, LGD and EAD reference datasets.
- 104) APRA expects an ADI to separately identify borrowers or facilities that default due to the 'unlikely to pay' criterion of the reference definition of default, and borrowers or facilities that default due to the '90 days past due' criterion.
- 105) APRA expects an ADI to record a default against a borrower or facility once the reference definition of default is met, regardless of CRM in place and the ability of a guarantor or credit protection provider to meet the underlying credit obligation. The default would be recorded against the PD grade of the borrower prior to the application of CRM. For example, where the ADI uses the PD substitution approach to reflect the risk-

mitigating effect of CRM in the regulatory capital calculation, a default of the underlying borrower would be recorded against the borrower's risk grade, rather than the risk grade of the guarantor or credit protection provider.

- 106) APS 113 (Attachment D, paragraph 72) permits an ADI to apply materiality thresholds to the reference definition of default for the purposes of estimating PD, LGD and EAD. Materiality thresholds could be defined in relation to the exposure amount or past due amount. A threshold based on the past due amount would generally be applicable in circumstances where days past due is determined based only on calendar days (such as revolving exposures without a regular minimum repayment schedule).
- 107) Prudent values for a materiality threshold would be \$1,000 for corporate, sovereign and financial institution exposures and \$100 for retail exposures. An ADI would clearly document any materiality thresholds used.
- 108) Where there are multiple defaults of a given facility or borrower, a prudent ADI would treat the facility or borrower as being continuously in default for PD, LGD and EAD estimation purposes if the time between the end of one default (i.e. return to performing) and the start of a subsequent default is less than nine months. A longer period may be used if it is appropriate to the type of exposure.

Re-aging

- 109) APS 113 (Attachment D, paragraph 73) requires an ADI to have documented policies on re-aging. Those policies would include:
- a) approval authorities and reporting requirements;
 - b) the minimum age of a facility before it is eligible for re-aging;
 - c) delinquency levels of facilities that are eligible for re-aging;
 - d) the maximum number of times that a facility may be re-aged; and
 - e) a reassessment of the obligor's capacity to repay.

Probability of default estimation

- 110) APS 113 (Attachment D, paragraph 75) requires an ADI to estimate PD for each borrower grade or pool based on an observed historical one-year default rate. For this purpose, the default rate would generally be calculated as:

$$\frac{D - E_D}{N - E_N}$$

where:

- a) D is the total number of borrowers (or facilities in the case of retail residential mortgage, QRR and other retail exposures) that defaulted during the observation period;

- b) E_D is the total number of borrowers or facilities excluded from the numerator. Such exclusions could include defaults deemed technical in nature (such as timing issues around expired facilities). ADIs would aim to limit the extent of technical defaults. Any exclusions from the numerator would be clearly identified and documented;
- c) N is the total number of the non-defaulted borrowers or facilities at the reference start date; and
- d) E_N is the total number of borrowers or facilities excluded from the denominator. Such exclusions would typically comprise:
 - i) borrowers (or facilities in the case of retail residential mortgage, QRR and other retail exposures) with zero exposure at the reference start date; and
 - ii) for corporate, sovereign, financial institution and SME retail exposures, exits. In this context, an exit is defined as a borrower with non-zero exposure at the reference start date and zero exposure at the end of the observation period.
 - iii) A borrower would not be classified as an exit if any of the following criteria are met: the exposure to the borrower matured during the observation period rather than being refinanced; the exposure to the borrower transitioned to the retail residential mortgage, QRR or other retail sub-asset class during the observation period; the borrower merged with another borrower (to which the ADI is also exposed) during the observation period;⁶ or the borrower defaulted during the observation period.

Any exclusions from the denominator would be clearly identified and documented.

- 111) For the purpose of calculating the default rate, an ADI would typically use a common reference date for all borrowers or facilities in a given sample; however, a variable reference date (such as the rating date for each borrower or facility) could also be used.
- 112) APRA expects an ADI to limit the number of ratings and defaults to one per borrower (or facility in the case of retail residential mortgage, QRR or other retail exposures) in a given observation period. The ADI's approach to multiple ratings and defaults would be documented clearly.
- 113) An ADI would generally ensure that a borrower or facility is included in the calculation of the default rate for the grade or pool to which it is assigned at the reference start date.
- 114) APS 113 (Attachment D, paragraph 76) requires an ADI to use count weighted default rates for PD estimation. While other weighting approaches are not permitted, APRA expects the ADI to still consider exposure based measures when assessing the risk-sensitivity and calibration of PD estimates.
- 115) APS 113 (Attachment D, paragraph 78) requires an ADI to use techniques for PD estimation that take appropriate account of long-run experience. For corporate, sovereign and financial institution exposures, such techniques could include:
 - a) internal default experience – In this case, good practice is to ensure that the PD estimates are reflective of the ADI's underwriting standards, and any differences in the rating system that generated the data and its current rating system. Where only limited data is available or where underwriting standards or rating systems have changed, APRA expects the ADI to add a greater margin of conservatism to its PD

⁶ Merged borrowers would be counted as one observation in the denominator and, depending on the performance of the borrowers, the numerator.

estimates. An ADI could use data that has been pooled across institutions, but would normally ensure that the pooled data is relevant to its own circumstances;

- b) mapping to external data – The ADI could associate or map its internal grades to the rating scale used by an external credit assessment institution (ECAI), or similar entity, and attribute the default rates observed for the external institution’s ratings to internal borrower grades. For this purpose, the ADI could compare its internal rating criteria to the criteria used by the external institution, and the internal and external ratings of any common borrowers. APRA expects the ADI to avoid biases or inconsistencies in the mapping approach or underlying data. When mapping to external data, the ADI would typically ensure that the external institution’s criteria underlying the data used for quantification are oriented to the risk of the borrower and do not reflect transaction characteristics. An ADI would typically compare its definition of default to that of the ECAI; and
- c) statistical default models – The ADI could use a simple average of PD estimates for individual borrowers in a given grade, where such estimates are drawn from statistical default prediction models.

Loss given default estimation

116) Three common approaches for calculating realised LGD are:

- a) discounting actual recovery cash flows;
- b) discounting changes in the balance of a facility (change-in-balance approach); and
- c) discounting write-off amounts associated with a facility (discounted write-off approach).

Any of these three measurement approaches could be used to calculate realised LGD. A consistent approach should be adopted within each of the following two categories of exposures: (i) all corporate, sovereign and financial institution exposures, and (ii) all retail exposures.

117) An ADI that uses the change-in-balance approach for LGD measurement purposes would generally calculate realised LGD prior to collection costs as:

$$LGD = \frac{EAD - \sum_{t=0}^T (B_{t-1} - B_t - WO_t + I_t + F_t) \times DF_t}{EAD}$$

where:

- a) B_t is the gross facility balance including post-default accrued interest and fees at time t ;
- b) WO_t is the amount written off in period t ;
- c) I_t is post-default interest accrued in period t . Post-default interest is set to zero if interest charges are not included in the balance;
- d) F_t is post-default fees accrued in period t ;
- e) DF_t is the discount factor in period t ; and
- f) $t = 0$ is the time of default, $t = T$ is the end of the workout period and t is typically measured in months.

118) An ADI that uses the discounted write-off approach for LGD measurement purposes would generally calculate realised LGD prior to collection costs as:

$$LGD = \frac{\sum_{t=0}^T (WO_t - F_t) \times DF_t}{EAD}$$

where the terms are as defined in paragraph 117) of this PPG.

119) APS 113 (Attachment D, paragraph 82) requires an ADI to take post-default drawings into account in LGD measurement. Post-default drawings are implicitly factored into realised LGD under the change-in-balance approach (as a negative recovery amount) and the discounted write-off approach. Where the ADI uses actual recovery cash flows to calculate realised LGD, post-default drawings are expected to be incorporated explicitly.

120) For defaults that resolve without a write-off, realised LGD prior to collection costs would usually be set equal to zero.

121) APS 113 (Attachment D, paragraph 80) requires an ADI to take collection costs into account in the measurement of realised LGD. Collection costs generally include direct and indirect costs associated with collecting on an exposure that are not charged to the borrower.

122) APRA expects an ADI to ensure that the discount rate or factor used in the realised LGD calculation is broadly consistent with the principles in Table 8.

Table 8. Principles for discount factors in the realised LGD calculation

Corporate, sovereign and financial institution exposures	Retail exposures
<ul style="list-style-type: none"> Where historical contractual interest rates associated with individual defaulted facilities are available, cash flows would be discounted using those interest rates. Where a different interest rate is applicable in the event of default, the post-default interest rate would be used as the discount rate. Where an ADI does not readily have data on historical contractual interest rates associated with individual defaulted facilities, it would discount cash flows at the Reserve Bank of Australia cash rate (or a comparable central bank overnight lending rate in the currency of the exposure) at the time of default plus 5 per cent. The discounted write-off approach would not be appropriate in this case. 	<ul style="list-style-type: none"> The ADI would discount cash flows using the facility-specific contractual interest rate at the time of default. Where a different interest rate is applicable in the event of default, the post-default interest rate would be used as the discount rate. Where facility-specific interest rates are not available, an ADI could use the product-level average contractual interest rate at the time of default. Product categories would typically be determined such that interest rates within each product category are sufficiently homogeneous (such as low rate credit cards as a standalone product category rather than credit cards).

123) APRA expects an ADI to clearly document its realised LGD measurement approach, including the discount rate methodology.

124) The numerical examples in Attachment 3 illustrate the calculation of realised LGD before collection costs under the change-in-balance and discounted write-off approaches.

- 125) An ADI could estimate and assign LGD at either a borrower or facility level.
- 126) Incomplete workouts are defaulted exposures for which the recovery process is still in progress and recoveries are not yet certain. Incomplete workouts are generally associated with recent defaults, but could also include defaults subject to an extended workout period. To avoid bias in its LGD estimates, APRA expects an ADI to:
- a) incorporate estimates of future recoveries and costs for incomplete workouts observed in the development sample in LGD modelling;
 - b) undertake sensitivity analysis of the assumptions used to estimate future recoveries and costs for incomplete workouts; and
 - c) set a maximum workout period beyond which additional recoveries are not expected to be realised.
- 127) APS 113 (Attachment D, paragraph 83) requires LGD estimates to reflect economic downturn conditions. For this purpose, an ADI could use averages of loss severities observed during periods of high credit losses, forecasts based on appropriately conservative assumptions or other similar methods. Estimates of LGD during periods of high credit losses could be made using either internal or external data.
- 128) APS 113 (Attachment D, paragraph 84) requires LGD estimates to be no less than the long-run default-weighted average LGD. In this context, default-weighted average means weighted by the count of defaults.

Exposure at default estimation

- 129) APS 113 (Attachment D, paragraph 98) requires an ADI to estimate EAD based on appropriately homogeneous segments or an estimation approach that disentangles the impact of different characteristics exhibited within the reference dataset effectively. Practices that would not generally comply with this requirement include the use of estimates based wholly or partly on:
- a) data from commitments with small unused limit availability being applied to facilities with large unused limit availability;
 - b) data from borrowers already identified as problematic at the reference date being applied to borrowers with no known issues. Problematic borrowers would include borrowers who were already delinquent, watchlisted by the ADI, subject to ADI-initiated limit reductions, blocked from further drawdowns or subject to other types of collection activity at the reference date; and
 - c) data that has been affected by product profile transformation over the observation period, unless that data has been mitigated effectively for such changes. APRA expects an ADI to demonstrate a detailed understanding of the impact of product profile transformation on EAD reference datasets and estimates, and confirm that the impact is immaterial or has been mitigated effectively within its estimation process. Effective mitigation would not include:
 - i) setting floors to CCF or EAD observations;
 - ii) using borrower-level estimates that do not cover the relevant product profile transformation options or inappropriately combine products with very different characteristics (such as revolving and non-revolving products);

- iii) adjusting only material observations affected by product profile transformation; and
 - iv) excluding observations affected by product profile transformation (thereby potentially distorting the representativeness of the remaining data).
- 130) Where an ADI estimates CCFs directly, APS 113 (Attachment D, paragraph 99) requires those estimates to be quarantined effectively from the potential effects of the region of instability associated with facilities that are close to being fully drawn down at the reference date. In meeting this requirement, the ADI could use another estimation method that avoids the instability issue or switch to the other method as the region of instability is approached. Including limit utilisation as a driver in the model could quarantine much of the portfolio from this issue. Ineffective mitigation approaches include capping and flooring the reference data, and omitting observations that are judged to be affected.
- 131) APS 113 (Attachment D, paragraph 93) requires an ADI to use EAD estimates that are appropriate for an economic downturn if those estimates are more conservative than the long-run default-weighted average EAD. In this context, default-weighted average means weighted by the count of defaults. In calibrating EAD estimates to an economic downturn, the ADI could consider the cyclical nature, if any, of the drivers of its EAD models, internal data from previous downturns or external data.
- 132) Where EAD estimates are based on alternative measures of central tendency (such as the median or a higher percentile estimate) or on data from a downturn period, APRA expects an ADI to confirm that those estimates do not fall below the long-run default-weighted average EAD for similar facilities.

Expected loss estimation

- 133) APS 113 (Attachment D, paragraph 102) requires an ADI to construct its best estimate of EL for each defaulted exposure based on current economic conditions and the facility's status. In meeting this requirement, an ADI could use provisions for defaulted exposures (inclusive of forward-looking adjustments and overlays) as its best estimate of EL.

Chapter 7 - Validation of rating systems and risk estimates

This section provides guidance on APS 113 Attachment D paragraphs 103-109.

- 134) APS 113 (Attachment D, paragraph 104) requires validation to be undertaken on an annual basis by personnel that are independent from those responsible for the development of an ADI's rating systems and risk estimates. Independence would be supported by a separation of reporting lines and assessed based on outcomes and actions. To maintain independence, an ADI would usually avoid cross-validation whereby two separate departments validate their respective rating systems alternately.
- 135) Where there is early intervention by the validation function during the development process, an ADI would ensure that such intervention does not put the independence of validation into question. The validation function would independently report on its activities to senior management and the relevant governance committee.
- 136) An ADI would generally ensure that the validation function has sufficient authority, stature and influence to challenge the work of the development function effectively.
- 137) Where independent validation has been delegated to an external party, the internal validation function would usually still retain full and ultimate responsibility for validation activities.
- 138) An ADI would typically establish an overarching validation framework to facilitate robust and consistent validation analysis of its rating systems and risk estimates. In this context, validation analysis includes activities undertaken by the monitoring and validation functions to verify that the rating systems and risk estimates are sound and performing as expected, and to identify and assess potential limitations and weaknesses.
- 139) Good practice is for the validation framework to address the following elements:
- a) **roles and responsibilities:** the roles and responsibilities of an ADI's monitoring and validation functions and other key stakeholders would be clearly defined. For example, the independent validation function would usually evaluate new rating systems and risk estimates, and any changes, prior to implementation. Ongoing validation of the rating systems post implementation, which includes monitoring as well as periodic review, would typically be a joint responsibility of the monitoring and validation functions;
 - b) **validation tasks and methodologies:** the validation function would usually undertake its own analysis of material aspects of the ADI's rating systems and risk estimates. This could include reviewing developmental evidence, replicating testing and conducting additional analysis as necessary. Validation tasks would be reviewed periodically to ensure that they continue to meet their objectives, and improved in line with changing industry practice and data availability. Certain validation tasks could be automated in order to provide the ADI with more capacity to focus on insights and commentary, and improve the timeliness of analysis and reporting;
 - c) **performance metrics and tolerance thresholds:** the validation framework would include defined criteria for conducting additional analysis and undertaking remedial actions such as redevelopment or recalibration;

- d) **scope and depth of analysis:** validation analysis would usually include both quantitative and qualitative assessment. The level of scrutiny applied by the validation function would be commensurate with the materiality, complexity, uncertainty and performance of the ADI's rating systems and risk estimates. Validation analysis would typically bring together available information from a range of sources in order to provide a holistic view of the effective functioning of the rating systems and risk estimates;⁷
- e) **validation review cycle:** the review cycle would recognise that validation is a continuous process. It would generally include a helicopter view of the ADI's validation work at least annually and additional analysis at a more granular level. The validation framework would usually address the prioritisation and frequency of validation activities. The framework would recognise that validation analysis might need to be undertaken out of cycle in response to emerging issues or special circumstances;
- f) **reporting:** mechanisms for reporting validation results, management responses and remediation efforts would be clearly documented. Meaningful summary information on validation results and remedial actions would be provided to senior management, governance committees and other relevant stakeholders on a regular basis. The ADI would ensure that it responds appropriately to validation findings. There would be an established process for the independent validation function to escalate issues that are not being addressed promptly; and
- g) **documentation:** the validation framework would establish standards for documenting validation analysis. Effective challenge of an ADI's rating systems and risk estimates would be documented thoroughly. The scope, methodology and limitations of validation analysis would be recorded. Where component ratings are aggregated into an overall validation rating, the ADI would clearly document the aggregation method employed.

Validation analysis

- 140) Validation analysis would generally comprise an evaluation of the following elements:
- a) **design and construction:** this would include a review of logic, conceptual soundness, methodology, risk drivers, rating philosophy, judgement and qualitative adjustments, limitations, weaknesses and key assumptions;
 - b) **quality of data inputs and outputs:** this would include an assessment of the representativeness of data, treatment of outliers and missing data, accuracy and completeness of data inputs, data cleansing and controls governing data capture;
 - c) **performance:** this would usually comprise an assessment of risk-ranking ability and backtesting results to verify the accuracy and suitability of model outputs. Where backtesting is inconclusive (such as because of too few defaults or no mix of high and low default periods), the ADI would consider other means of demonstrating the validity of its ratings and risk estimates.⁸ Analysis of rating system performance would be undertaken at a range of different levels (such as risk grade, intuitive risk segment, portfolio and rating system levels). The performance and applicability of group models would be assessed at a local level;

⁷ For example, the validation function could leverage insights from the credit assurance function about the effectiveness of credit risk assessment and the ongoing operational integrity and consistency of internal ratings.

⁸ This could include benchmarking analysis, scenario and sensitivity testing, reviewing the relevance of developmental logic and assessing whether the rating system is operating as intended.

- d) **conservative adjustments:** this would include an assessment of how conservative adjustments applied to internal rating systems and risk estimates are expected to mitigate limitations with the methodology and/or data;
 - e) **implementation:** this would usually include quality assurance of the computer code, and ensuring that implementation is consistent with development documentation and is subject to robust change control processes;
 - f) **use:** this would include analysis of the accuracy and consistency of ratings (such as recommended re-grades), overrides, aged ratings, aged financial information, technical defaults, unrated exposures and feedback received from users. An assessment of overrides would consider the implications of override rates for the validity of the rating systems and the appropriateness of rating policies;
 - g) **documentation:** this would include an assessment of the quality of documentation against internal standards; and
 - h) **management reporting:** this would include a review of the effectiveness of reporting to senior management, governance committees and other key stakeholders.
- 141) Good practice is for an ADI to evaluate, as part of ongoing validation, many of the elements evaluated at initial validation of the rating systems and risk estimates. For example, in addition to assessing performance, data quality and usage, ongoing validation may include a re-assessment of design and construction elements, and key limitations and assumptions.
- 142) Validation analysis would generally lead to an overall opinion about the adequacy of an ADI's rating systems and risk estimates. The validation opinion would form the basis of recommendations in respect of (ongoing) approval, enhancements, and conditions or constraints on usage to mitigate known limitations.
- 143) Validation analysis would generally incorporate all IRB exposures in a given portfolio at the reference date, including any modelling exclusions. Exposures would not be excluded for being below a certain size threshold; however, this would not preclude testing at different levels based on exposure size.
- 144) The validation of PD estimates for corporate, sovereign, financial institution and SME retail exposures is expected to be performed on a borrower basis. Analysis at a more aggregated level, such as borrower group or rating event could also be undertaken as a supplement but not as a replacement (acknowledging that a group rating is often assigned using consolidated financial information on the basis of cross-collateralisation or cross-guarantees).
- 145) Where supervisory LGD and EAD estimates are used, a prudent ADI would:
- a) undertake validation analysis at least annually;
 - b) include validation outcomes in summary reports or dashboards for management. More generally, the governance and oversight of supervisory LGD and EAD estimates would be commensurate with that of internal models and estimates of similar materiality and complexity;
 - c) for supervisory EAD estimates, undertake backtesting analysis at an estimate level and asset class level. 'Estimate level' refers to a category of exposures for which a specific estimate is prescribed; and
 - d) for supervisory LGD estimates, undertake backtesting analysis at an estimate level and, where relevant, at different levels of collateral coverage (e.g. for partially secured exposures).

- 146) APS 113 requires that an ADI use information about the validation of supervisory LGD and EAD estimates in its internal assessment of capital adequacy. In meeting this requirement, the ADI would discuss potential actions and implications for capital adequacy with APRA where realised experience materially and consistently exceeds the supervisory LGD or EAD estimates.
- 147) APS 113 requires regular analyses of arrangements that are excluded from the definition of a commitment. For this purpose, a prudent ADI would conduct monitoring of the:
- a) volume of limits excluded from the definition of a commitment;
 - b) rate of conversion or utilisation of such limits to commitments; and
 - c) proportion of customers that default within 12 months of drawdown of such limits and resulting losses.

Chapter 8 - Recognition of collateral, and receivables

This section provides guidance on APS 113 Attachments E and F.

Recognition of collateral

Eligible financial receivables

- 148) APS 113 (Attachment E, paragraph 4) details the operational criteria that must be met in order for an ADI to recognise financial receivables under the FIRB approach. One requirement is that the ADI must maintain a continuous monitoring process over the financial receivables taken as collateral. This process would include, as appropriate, monitoring over:
- a) aging reports;
 - b) control of trade documents;
 - c) borrowing base certificates;
 - d) audit of collateral;
 - e) confirmation of accounts;
 - f) control of the proceeds of accounts paid; and
 - g) analyses of dilution and regular financial analysis of both the obligor and the receivables' obligors. Good practice is for this to occur when a small number of large receivables are taken as collateral.
- 149) Compliance with loan covenants, environmental restrictions and other legal requirements would generally be reviewed on a regular basis.
- 150) In order to assess the credit risk of the financial receivables taken as collateral, an ADI would assess the borrower and the type of customers with whom it transacts, amongst other factors.

Eligible commercial or residential real estate

- 151) APS 113 (Attachment E, paragraph 5) details the operational criteria that must be met in order for an ADI to recognise commercial and residential real estate under the FIRB approach. One requirement is the valuation of such properties at least annually. In order to satisfy this requirement, statistical methods of valuing collateral (such as reference to house price indices and sampling) could be used to update estimates or to identify collateral that may have declined in value and require re-appraisal. A formal valuation by a qualified professional is generally expected to be undertaken when information indicates that the value of collateral may

have materially declined relative to general market prices, or when a credit event such as default occurs. Further guidance on prudent practice for determining security value is provided in APG 220.

Purchased receivables

- 152) For purchased receivables that qualify for the top-down approach, APS 113 requires an ADI to use methods and data for estimating PD, LGD and expected long-run average loss rates that comply with the risk quantification standards for retail exposures.
- 153) Risk quantification is expected to reflect all information available to an ADI regarding the quality of the underlying receivables, including data for similar pools provided by the seller, the ADI or external sources. An ADI would determine whether the data provided by the seller is consistent with the expectations agreed upon by both parties concerning the type, volume and ongoing quality of receivables purchased. Where this is not the case, APRA expects the ADI to obtain and rely upon more relevant data.
- 154) To qualify for the top-down approach for default risk, APS 113 (Attachment F, paragraph 21) requires an ADI to closely control and monitor the pools of receivables and overall lending relationship. This would generally include the following:
- a) **legal certainty:** the structure of the facility under which the receivables are purchased would ensure that, in all foreseeable circumstances, the ADI has effective ownership and control of the cash remittances from the receivables, including incidences of seller or servicer distress and bankruptcy. When borrowers make payments directly to a seller or service, the ADI would verify regularly that all payments are forwarded to it within the contractually agreed terms. Ownership over the receivables and cash receipts would be protected against bankruptcy stays or legal challenges that could materially delay the ADI's ability to liquidate or assign the receivables or retain control over cash remittances;
 - b) **monitoring systems:** the ADI would be able to monitor both the quality of the receivables and the financial condition of the seller and servicer. In particular:
 - i) the ADI would assess the correlation between the quality of the receivables and the financial condition of both the seller and servicer. The ADI would have in place internal policies and procedures that provide adequate safeguards to protect against such contingencies, including the assignment of an internal rating for each seller and servicer;
 - ii) the ADI would have clear and effective policies and procedures for determining seller and servicer eligibility. The ADI or its agent would conduct periodic reviews of sellers and servicers in order to verify the accuracy of reports from the seller or servicer, detect fraud or operational weaknesses, and verify the quality of the seller's credit policies and the servicer's collection policies and procedures. The findings of those reviews would be documented;
 - iii) the ADI would have the ability to assess the characteristics of the pools of receivables including over-advances, history of the seller's arrears, bad debts and bad debt allowances, payment terms and potential contra-accounts;
 - iv) the ADI would have effective policies and procedures for monitoring, on an aggregate basis, single-borrower concentrations both within and across pools of receivables; and
 - v) the ADI would receive timely and sufficiently detailed reports of the aging of receivables and dilution to ensure compliance with the ADI's eligibility criteria and underwriting policies governing purchased

receivables, and provide an effective means with which to monitor and confirm the seller's terms of sale (such as invoice date aging) and dilution;

- c) **effective workout systems:** the ADI would have policies and procedures for the early detection and control of a deterioration in the seller's financial condition and the quality of receivables. In particular:
- i) the ADI would normally have clear and effective policies, procedures and information systems to monitor compliance with all contractual terms of the facility (such as covenants, advancing formulas, concentration limits, early amortisation triggers), as well as policies governing advance rates and eligibility of the receivables. The ADI's systems would generally track covenant violations and waivers as well as exceptions to established policies and procedures;
 - ii) to limit inappropriate draws, the ADI would usually have policies and procedures for detecting, approving, monitoring and correcting over-advances; and
 - iii) the ADI would have policies and procedures for managing financially weakened sellers or servicers or deterioration in the quality of pools of receivables. This could include early termination triggers in revolving facilities and other covenant protections, a structured and disciplined approach to managing covenant violations, and policies and procedures for initiating legal action and managing problem receivables;
- d) **effective systems for controlling collateral, credit availability and cash:** the ADI would have policies and procedures governing the control of receivables, cash and credit. Those policies and procedures would generally:
- i) specify all material elements of the receivables purchase program, including advance rates, eligible collateral, documentation, concentration limits and how cash remittances are managed. The elements would usually take account of all material relevant factors, including the seller's and servicer's financial condition, risk concentrations and trends in the quality of the receivables, and the seller's customer base; and
 - ii) ensure that funds are only advanced against specified supporting collateral and documentation (such as servicer attestations, invoices, shipping documents etc); and
- e) **compliance with the ADI's internal policies and procedures:** given the reliance on monitoring and control systems to limit credit risk, the ADI would usually have an internal process for assessing compliance with all critical policies and procedures including:
- i) regular audits of all critical phases of the ADI's receivables purchase program;
 - ii) verification of the separation of duties between the assessment of the seller or servicer and the assessment of the obligor, and between the assessment of the seller or servicer and the field audit of the seller or servicer; and
 - iii) evaluations of back office operations with particular focus on its independence, qualifications, experience, staffing levels and supporting systems.

Chapter 9 – Initial IRB approval

This section provides guidance on APS 113 paragraphs 42-51.

General expectations for an ADI seeking IRB approval

- 155) In determining whether to pursue IRB accreditation, an ADI would consider:
- a) the extent to which the ADI has, or plans to implement, an advanced approach to risk and capital management for its material risks (paragraph 156 and Table 9 may be used as a guide);
 - b) the availability and quality of data and supporting infrastructure for modelling purposes; and
 - c) the technical capability of the ADI's resources.
- 156) APRA expects an ADI seeking approval to use an IRB approach for regulatory capital to demonstrate an advanced approach to risk and capital management for material risks. At a high level, this is an approach that incorporates techniques to obtain a quantitative understanding of all material risks and the potential for severe losses, which is used in the Internal Capital Adequacy Assessment Process (ICAAP) and the ADI's ongoing decision-making and oversight processes. Key criteria are outlined in Table 9.

Table 9. Advanced approach to risk and capital management

Criteria	Description
Governance and oversight	The ADI clearly articulates the roles of the Board and senior management in overseeing advanced risk and capital management. The Board would typically be involved in the decision to implement an advanced approach to risk and capital management for material risks, and how it fits in with the ADI's strategy, risk appetite and risk management framework. Management would focus more on oversight of effective implementation and use of outputs in understanding the risk profile.
Resourcing capability and capacity	The risk management function includes sufficient independent specialist risk resources with appropriate technical skills for each material risk.
Risk management framework	The ADI's risk management framework facilitates reasonable and risk-sensitive quantitative estimates of risk including the potential for severe losses.
Management awareness	The ADI's business line management is able to clearly articulate the drivers of its risk profile.
Internal capital assessment	Each material risk is considered as a distinct risk class within the ICAAP with common quantitative elements used as part of both the risk and capital management frameworks. The ADI's approach to internally estimating required capital includes

	estimates for all material risks and is capable of attributing capital for those risks to the ADI and any material business lines.
Use in risk management	The ADI uses risk measurement inputs and outputs to inform risk management, monitoring and oversight. Some examples include managing risk positions, setting risk limits and delegations, pricing and performance measurement.

157) In line with a key requirement of *Prudential Standard CPS 230 Operational Risk Management* that an ADI's approach to operational risk must be appropriate to its size, business mix and complexity, APRA expects an ADI seeking approval to use the IRB approach to apply appropriately sophisticated approaches in assessing its operational risk profile, including potential quantitative impacts identified and assessed in scenario analysis and from incidents and near-misses.

Use and experience

158) APS 113 (paragraph 44) requires an ADI to demonstrate that models are broadly in line with APS 113 requirements for at least three years prior to an IRB approval being given. An ADI must also meet the use test in APS 113 (Attachment D, paragraphs 67-68). The overall objectives of the use and three-year experience requirements are to ensure that there is meaningful challenge arising from the use of models for internal purposes, thereby supporting the accuracy, robustness and timeliness of the models that are intended to be used for regulatory capital. In relation to use and experience:

- a) there may be differences in maturity in the use of the models across different purposes;
- b) there may be practical reasons for differences in the models that are used internally and those proposed for regulatory capital purposes. In this case, the use test would be considered as being met if an ADI is able to demonstrate that the methodologies and data used for both purposes are broadly consistent and the models are assessed as fit-for-purpose by the ADI's independent validation function;
- c) APRA expects at least one iteration of validation and governance would be applied to the final IRB models prior to IRB approval. This should include an independent assessment of early life model performance and/or rating outcomes. Subject to meeting this expectation, the ADI's models need not be the final, fully compliant models for the purpose of meeting the three-year experience requirement, and the models may undergo improvement and development during this period; and
- d) further guidance regarding the use of internal ratings is outlined in paragraphs 95 to 97 of this PPG.

Data management

159) As part of an IRB application, an ADI would provide information regarding its data management practices, as outlined in Table 10. APRA expects:

- a) an ADI to have sound data to support the development, validation and use of internal models. This would include having appropriate data management governance, processes and controls to ensure data quality, and regularly testing the quality of the data and effectiveness of controls; and
- b) at the time of initial IRB approval, an ADI's IRB data management practices need not be consistent with all aspects of CPG 235, provided the ADI has adequate mitigants in place to address any key data limitations

impacting the implementation of the IRB approach. For example, this could include incorporating larger margins of conservatism in internal models where data is less satisfactory. APRA would also expect the ADI to have a high-level plan to address any key gaps in IRB data management post-implementation.

Initial IRB implementation

160) APS 113 (paragraph 44) outlines that an ADI must demonstrate material compliance with the minimum requirements of APS 113 at the time of its application for initial approval to use an IRB approach, subject to any gaps to full compliance having been assessed by APRA as having minimal impact on the ADI's IRB implementation and having a clear and achievable remediation plan agreed with APRA. APRA may impose a capital overlay and/or other approval conditions on the ADI as a potential mitigant against any areas of non-compliance.

161) An ADI's practices need not be consistent with all aspects of APG 113 at the time of initial IRB approval. APRA expects the ADI to work toward meeting these expectations post-implementation.

162) APS 113 (paragraph 45) requires that, in its initial application to use an IRB approach, an ADI must, unless determined otherwise by APRA, seek to use an internal risk measurement model for interest rate risk in the banking book (IRRBB). An example of a determination by APRA is an approval for an ADI to use the IRB approach and be eligible to realise the benefits of an initial phase of IRB accreditation ahead of obtaining IRRBB accreditation, subject to:

- a) the ADI holding an APRA-determined RWA amount that is commensurate with the ADI's interest rate risk until IRRBB accreditation is achieved – the APRA-determined RWA amount would be phased in taking into consideration the portfolios in each phase of a phased roll-out of an IRB approach and the portfolios approved for permanent partial use;
- b) the ADI demonstrating that it has an advanced risk and capital management approach in relation to IRRBB at the time of initial IRB accreditation;
- c) the ADI having a credible and timely plan for obtaining IRRBB accreditation; and
- d) APRA's assessment of the appropriateness of the phased implementation of IRRBB, having regard to the size, business mix and complexity of the ADI.

APRA expects the ADI to obtain IRRBB accreditation within a reasonable period of receiving IRB approval and no later than as part of a final phase of IRB accreditation.

163) APS 113 (paragraphs 48 to 50) permits an ADI to adopt a phased roll-out of an IRB approach for material asset classes and business units subject to approval from APRA and outlines requirements in relation to the implementation plan and capital benefit during the roll-out period. In relation to phased roll-out:

- a) the general expectation for the phased roll-out period (that is, from initial approval to the full roll-out of an IRB approach) is up to three years. APRA may consider further flexibility on a case-by-case basis;
- b) the full capital benefit may be available at each phase. If the roll-out period exceeds the agreed timeframes in the plan, APRA may consider imposing capital add-ons for uncertainty, or in more significant cases, revoking the ADI's IRB approval.

- c) the initial approval is expected to cover the larger part of the ADI's aggregate credit exposures. The first phase of the roll-out may comprise a single portfolio, if appropriate for the size, business mix and complexity of the ADI; and
- d) the selection of portfolios for initial IRB approval is expected to not be motivated by 'cherry-picking' (in other words, the motivation is not to arbitrage between the IRB and standardised approaches).

164) Under APS 110, ADIs that have been approved to use an IRB approach are required to hold additional Common Equity Tier 1 (CET1) capital. For ADIs seeking approval for a phased roll-out of an IRB approach, the additional CET1 capital requirement would not apply to portfolios that are proposed to transition to the IRB approach at a later phase until they are accredited.

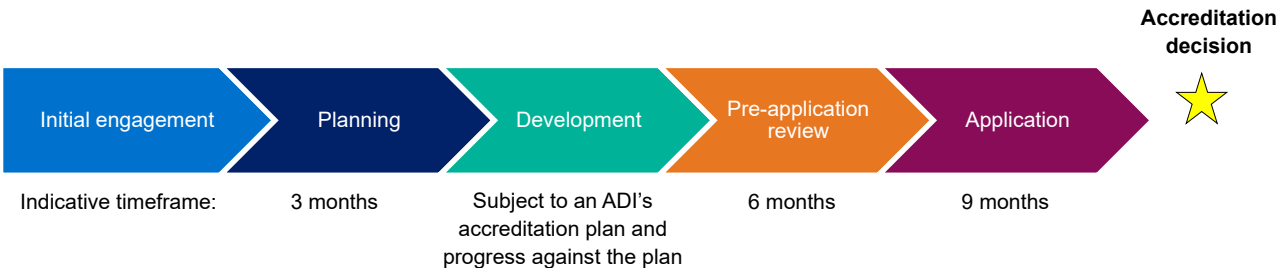
Permanent partial use

165) APS 113 (paragraph 51) permits an ADI to use a combination of an IRB approach and the standardised approach for regulatory capital purposes on a permanent basis (permanent partial use). In general, APRA expects the use of permanent partial use to be limited given the requirement for ADIs that have been approved to use an IRB approach to model all material credit portfolios. APRA expects that there is sound rationale for adopting permanent partial use, that it is appropriate for the size, business mix and complexity of the ADI, and it is not motivated by cherry-picking between IRB and standardised approaches. For example, the use of the standardised approach might be appropriate for portfolios that are in run-off or immaterial in size or where data challenges (such as low default portfolios) impede the development of credible models.

IRB application process

166) The accreditation process comprises five broad stages: initial engagement, planning, development, pre-application review and application, as outlined in Figure 1. The portfolios in each phase of a phased roll-out approach may be at different stages of the IRB accreditation process. Figure 1 also provides indicative timeframes, where relevant, for each stage.

Figure 1: Overview of end-to-end IRB accreditation process



Initial engagement

167) Paragraph 155 outlines general considerations for an ADI seeking to pursue IRB accreditation. An ADI would typically approach APRA to engage early to discuss these expectations and ensure it has the appropriate information to support its decision.

Planning

- 168) At the start of the planning stage, the ADI would have decided to seek IRB approval and commenced the development of a high-level plan for IRB accreditation, which involves an assessment of the ADI's current state of preparedness for IRB accreditation and plans to ultimately demonstrate IRB readiness.
- 169) Table 10 outlines key features of an IRB accreditation plan. The ADI's plan would allow APRA to assess the suitability and feasibility of the ADI's proposed pathway to accreditation, including the scope of a potential IRB application, phased implementation approach (where applicable) and target accreditation start date.
- 170) The ADI is also expected to confirm that it is committed to making the necessary investment in achieving accreditation and there is appropriate Board and senior management support.

Development

- 171) In the development stage, the ADI would have commenced the development of internal models and frameworks to meet key APS 113 requirements in line with its accreditation plan. This stage is expected to be the longest stage of the accreditation process and is highly dependent on the ADI's accreditation plan and its progress against that plan.
- 172) During this stage, the ADI may seek regular engagements with APRA to obtain feedback on key model development decisions, such as high-level methodology, definitions and data treatments. Once regular engagement commences, the ADI would generally be expected to start paying a levy to recover the costs incurred by APRA during the accreditation process.

Pre-application review

- 173) In the pre-application review stage, the ADI would submit, for APRA review and feedback, internal models and other key accreditation evidence such as on use and experience. The purpose of the pre-application review is to support the ADI's readiness for an IRB application and identify any material issues that may need to be addressed prior to an IRB approval being given.
- 174) APRA expects that the models submitted for the pre-application review are the final models proposed for regulatory capital purposes that are developed, fully documented and validated. The pre-application review of models would focus primarily on model design. The final models need not be implemented at this stage.
- 175) Where phased IRB implementation approach is sought, the pre-application review will typically cover the models in the first roll-out phase or otherwise agreed in the IRB accreditation plan. The ADI may submit models progressively, to facilitate more timely feedback. The timeframe for the pre-application review stage is dependent on the number and complexity of the ADI's internal models and whether staggered reviews are undertaken but is generally expected to take no more than six months.
- 176) Following the pre-application review stage and prior to submitting an accreditation application, the ADI may need to undertake further work on the models or other key accreditation components to address any material issues raised by APRA.

Application

- 177) The application stage would commence once the ADI submits its application for initial IRB approval to APRA. The IRB application documentation is set out in Table 10. To the extent possible, supporting documentation contained in the ADI's IRB application would have been developed for internal purposes rather

than IRB approval. Any summary documents requested by APRA are intended to be tools aimed at guiding APRA to the appropriate source documents such as policies, internal reports and Board briefing material. APRA expects the ADI to use cross-referencing extensively to avoid undue repetition or duplication in the documentation. During the application stage, the ADI is expected to ensure that:

- a) it has implemented a validation and control framework consisting of policies, procedures and human capital and encompassing both quantitative and qualitative aspects of the internal models and ratings;
- b) at least two quarters of parallel run have been completed;
- c) at least one iteration of validation and governance have been applied to the final IRB models prior to IRB approval. This should include an independent assessment of early life model performance and/or rating outcomes; and
- d) use and experience requirements are met.

The ADI may utilise part of the application stage to meet these expectations; however, all aspects would need to be completed at least three months from the target accreditation start date.

- 178) The ADI would be expected to engage with APRA in a range of onsite and offsite APRA reviews of the ADI, as part of the assessment of the ADI’s accreditation application. The ADI would be provided with regular and timely feedback throughout on the application, as well as the opportunity to respond to any material issues raised.
- 179) The ADI would be expected to submit a complete application. APRA endeavours to provide an accreditation decision within nine months of the ADI submitting a complete application to APRA. However, where the ADI submits an incomplete application, the accreditation decision may take longer than nine months. To facilitate a timely accreditation decision, APRA would aim to provide early feedback on the completeness of the ADI’s application.

Table 10. IRB application documentation

Information		Description
Documentation to be provided as part of the Planning stage		
1.1	General information	<ul style="list-style-type: none"> • The ADI’s rationale for seeking approval to use an IRB approach and what it aims to achieve as a consequence of this use. • The main point of contact for the ADI’s application.
1.2	General expectations of an ADI seeking IRB approval	<ul style="list-style-type: none"> • Self-assessment against APRA’s general expectations of an ADI seeking IRB approval (outlined in paragraph 156 and Table 9), including plans to address deficiencies.
1.3	Scope of the IRB application	<ul style="list-style-type: none"> • The details of, and rationale for, the IRB approach for which approval is being sought for each business line and portfolio. This would include: <ul style="list-style-type: none"> - the portfolio segments for which the ADI is intending to use an IRB approach and the relative sizes of those segments;

		<ul style="list-style-type: none"> - where the ADI is seeking approval for a phased roll-out of an IRB approach (including describing which portfolios are included in each phase); - where the ADI is seeking permanent partial use of the standardised approach for any portfolio segments, relevant supporting evidence for permanent partial use; and - what IRB approaches are being sought – AIRB/FIRB, slotting, purchased receivables, etc.
1.4	Organisation and legal entity structures	<ul style="list-style-type: none"> • The organisational structure of the ADI (including reporting lines to senior executives) for staff involved in credit risk model development, validation, monitoring and governance, data capture and reporting. APRA expects the ADI to outline the specific responsibilities of each area in the organisational structure. • Details of how the ADI’s organisational structure maps to the group’s legal entity and geographic structure, and the units that are linked to the various IRB asset classes. • A summary of the ADI’s governance and reporting structure. This would clearly set out the composition and roles of management, executive and Board committees involved in the development, ongoing validation, use and oversight of models, and other risk measurement and management systems.
1.5	High-level IRB accreditation project plan	<ul style="list-style-type: none"> • Assessment of current state and key activities needed to demonstrate readiness for using the IRB approach. • Key milestones to achieve target state. • Proposed accreditation start date and timing of each phase where applicable, noting that this is indicative and subject to change.
Documentation to be provided as part of the Pre-application review stage		
2.1	Model documentation	<p>For each model or rating system:</p> <ul style="list-style-type: none"> • model development documentation; • independent model development validation report; and • where available, presentation and discussion of the model at the governance committee.
2.2	Use and experience	<ul style="list-style-type: none"> • Existing management reporting and documents which can demonstrate the various internal uses of the risk estimates and of how the estimates are embedded in the day-to-day risk management systems and culture of the ADI. Some examples include: <ul style="list-style-type: none"> - the ongoing management and reporting of risk positions; - setting risk approval delegations, and individual and portfolio position limits; - articulating risk appetite; - setting provisions and capital allocations; - pricing; and - profitability or performance measurement and compensation.

Documentation to be provided as part of the Application stage

3.1	Updated documentation from the Planning and Pre-application stages	<ul style="list-style-type: none"> • Where documents have been revised in light of APRA feedback (in earlier stages of review), the ADI would provide updated documentation. Otherwise, the application would reference previously provided material, where applicable.
3.2	APS 113 self-assessment	<ul style="list-style-type: none"> • A full self-assessment of the ADI's compliance with the minimum APS 113 requirements. The self-assessment document would detail: <ul style="list-style-type: none"> - the self-assessment process undertaken by the ADI; - how, in its view, the ADI meets each of the relevant requirements of APS 113; - identified compliance gaps, including details of gaps between the ADI's current practices and the minimum requirements; and - the steps planned and timetable for closing gaps. • Sign-off from the chair of the Board that: <ul style="list-style-type: none"> - the Board has reviewed, and considered the adequacy of, the self-assessment process and results; - on the basis of its review, the Board considers that the ADI meets the requirements set out in APS 113, except where those requirements have been noted by the ADI as exceptions in the self-assessment document; - where exceptions are noted, the Board is satisfied that the ADI will be able to meet its plan to address those exceptions; and - a copy of the minuted discussion of the Board in relation to the ADI's self-assessment.
3.3	Model register	<ul style="list-style-type: none"> • A register of rating systems, models and tools used by the ADI in assigning internal ratings and risk estimates.
3.4	Use and experience	<ul style="list-style-type: none"> • A summary of how the ADI considers that it meets the use and experience requirements of APS 113. • In the case of the use requirement, a summary of the various internal uses to which the risk estimates are put and of how the estimates are embedded in the day-to-day risk management systems and culture of the ADI. • APRA expects the ADI to provide details of how the risk estimates are used in each of these activities and any other activities deemed to be relevant by the ADI. <p>The ADI would detail how the use of the risk estimates demonstrates meaningful challenge of the validity of the estimates. Each relevant IRB asset class would be covered explicitly. Any differences that exist in different parts of the ADI would be highlighted.</p>

3.5 Data management

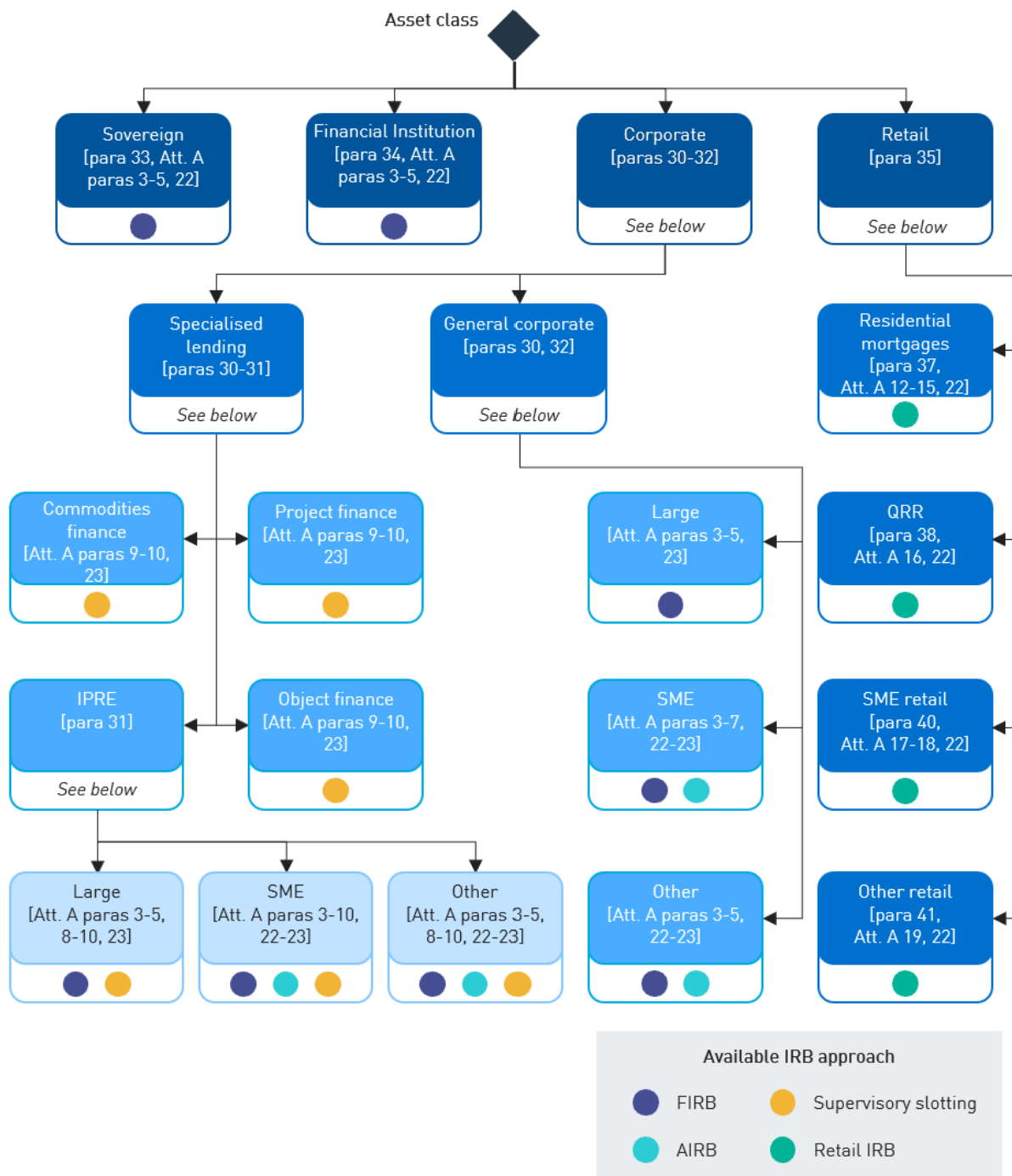
- A summary of the data management practices for IRB data. APRA's expectations in this area are captured in CPG 235. This would include:
 - a diagram of the data architecture covering the collection of data, data storage and how relevant data is collated for regulatory capital purposes;
 - an outline of all data flows between those systems, including whether any manual processes are involved in such flows; and
 - details of the validation (including reconciliation) process between databases and systems, including between finance and risk databases, and how unreconciled items are treated including the materiality threshold for investigation.

- Independent sign-off on the:
 - sufficiency of controls to maintain data quality (including accuracy and completeness) as data flows between the data capture systems and calculation engine;
 - data quality (including accuracy and completeness) of the data used to develop and validate the relevant models;
 - data quality (including accuracy and completeness) of the data used in the regulatory capital calculation;
 - accuracy of the regulatory capital calculation engine; and
 - adequacy of associated ongoing procedures and controls, including controls for ensuring that changes in ratings, model parameters and assumptions, and calculation methodologies are accurately entered into the calculation of regulatory capital.

- Independent sign-off is expected to be undertaken by an appropriate external party such as the ADI's external auditor. A staged approach could be used, but the final assessment would be over the production environment. Independent parties are expected to use a combination of control assessments and data inspection. The assessment would include end-to-end testing of systems and processes on a sample basis. The findings section of the report would include:
 - a summary of work conducted to support the report conclusions;
 - a list of internal control weaknesses identified and observations as to the quality (including accuracy and completeness) of the data inspected; and recommendations to rectify weaknesses that the independent party believes are necessary and/or of material importance.

Attachment A – IRB asset class flowchart

This flowchart provides an indicative mapping of IRB asset classes using the requirements in APS 113.



Paragraph references are to APS 113.

See Att. A on calculating risk components for each IRB asset class and Att. C on expected loss and provisioning.

See Att. A paragraphs 20-21 for the capital treatment of lease exposures.

A scaling factor of 1.1 applies to all IRB asset classes except for exposures under the supervisory slotting approach and for the residual value component of lease exposures [Att. A, para 2].

Attachment B – IRB asset class mapping

While there is no direct linkage between the IRB and standardised asset classes, Table 11 provides an indicative mapping. The table excludes standardised asset classes that could map to any IRB asset class, such as exposures through a third party.

Table 11. *Indicative mapping to standardised asset classes*

IRB approach		Standardised approach
Asset class	Description of segment	
Sovereign	Exposures to sovereigns	Sovereign
Financial institution	Exposures to banks	Bank
	Exposures to non-bank financial institutions	Corporate (excluding specialised lending)
	Covered bond exposures	Covered bonds
	Exposures to domestic public sector entities that carry out the functions of a financial institution	Domestic public sector entities
Corporate (excluding specialised lending)	Exposures that are not secured by real estate	Corporate (excluding specialised lending)
	Exposures for which residential real estate is the predominant real estate collateral	Residential property – other
	Exposures for which commercial real estate is the predominant real estate collateral	Commercial property – not dependent on property cash flows
	Exposures that relate to land acquisition for development and construction purposes, or the development and construction of real estate, but are not materially dependent on real estate income for repayment	ADC
	Exposures to domestic public sector entities (except exposures to public sector entities that carry out the functions of a financial institution)	Domestic public sector entities
	Subordinated debt	Subordinated debt
	Exposures that relate to land acquisition for development and	ADC

Corporate – specialised lending – IPRE	construction purposes, or the development and construction of residential or commercial real estate	
	Exposures for which residential real estate is the predominant real estate collateral	Residential property – other
	Exposures for which commercial real estate is the predominant real estate collateral	Commercial property – dependent on property cash flows
	Exposures that are not secured by real estate	Corporate (excluding specialised lending)
Corporate – specialised lending – project finance	Project finance exposures	Project finance
Corporate – specialised lending – object finance	Object finance exposures	Object finance
Corporate – specialised lending – commodities finance	Commodities finance exposures	Commodities finance
Retail – retail residential mortgage	Owner-occupied principal-and-interest loans	Residential property – owner-occupied principal-and-interest
	Owner-occupied interest-only loans	Residential property – other
	Investment loans secured by finished residential real estate	
	Borrowers with five or more mortgaged investment properties	
	Investment loans secured by residential real estate under construction or land upon which residential real estate will be constructed	ADC
Retail – SME retail	Exposures that are not secured by real estate	SME retail
	Exposures for which residential real estate is the predominant real estate collateral	Residential property – other
	Exposures for which commercial real estate is the predominant real estate collateral	Commercial property – not dependent on property cash flows
	Exposures that relate to land acquisition for development and construction purposes, or the development and construction of residential or commercial real estate	ADC

Retail – QRR	QRR exposures	Credit cards
Retail – Other retail	Other retail exposures	Other retail

Attachment C – LGD calculation examples

The numerical examples in this Attachment illustrate the calculation of realised LGD before collection costs under the change-in-balance and discounted write-off approaches.

Example 1: Write-off

A defaulted facility has a post-default contractual interest rate of 1 per cent per month, which keeps accruing post default, and an exposure at default of \$100. The customer makes a post-default drawdown of \$10 in month 3 and is charged a \$1 fee. The entire balance is written off after 6 months.

Month	Default	1	2	3	4	5	6
Outstanding balance	100	101	102	114	115	116	0
Drawdown				10			
Interest charge		1	1	1	1.1	1.2	1.2
Fee				1			
Write-off							117
Discount factor	1	0.99	0.98	0.97	0.96	0.95	0.94
Recovery x discount factor	0	0	0	-9.7	0	0	0
LGD (change-in-balance approach)	110%						
(Write-off – fee) x discount factor	0	0	0	-1	0	0	111
LGD (discounted write-off approach)	110%						

Example 2: Full recovery

A defaulted facility has a post-default contractual interest rate of 1 per cent per month, which keeps accruing post default, and an exposure at default of \$100. The customer makes a post-default drawdown of \$10 in month 3 and is charged a \$1 fee. The entire balance is recovered after 6 months. Note that even though the calculated LGD in this example is -1 per cent, it would be set to 0 per cent according to paragraph 120) of this PPG.

Month	Default	1	2	3	4	5	6
Outstanding balance	100	101	102	114	115	116	0
Drawdown				10			
Interest charge		1	1	1	1.1	1.2	1.2
Fee				1			
Write-off							
Discount factor	1	0.99	0.98	0.97	0.96	0.95	0.94
Recovery x discount factor	0	0	0	-9.7	0	0	111
LGD (change-in-balance approach)	-1%						
(Write-off – fee) x discount factor	0	0	0	-1	0	0	0
LGD (discounted write-off approach)	-1%						