Prudential practice guide

GPG 116 Insurance Concentration Risk

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Contents

About this guide

Prudential Standard GPS 116 Capital Adequacy: Insurance Concentration Risk Charge (GPS 116) sets out APRA's requirements in relation to insurance concentration risk. This prudential practice guide (PPG) assists **general insurers** and **Level 2 insurance groups** in complying with those requirements and, more generally, to outline prudent practices in relation to insurance concentration risk.

This PPG applies to all general insurers and Level 2 insurance groups unless otherwise specified. For the purposes of this PPG, the term 'insurer' refers to both a general insurer and a Level 2 insurance group, unless the section specifically relates to a Level 2 insurance group. In addition, the term **Appointed Actuary** also refers to the **Group Actuary** of a Level 2 insurance group.

This PPG is designed to be read together with GPS 116 and does not address all prudential requirements in relation to insurance concentration risk. It also incorporates relevant aspects of *Prudential Standard GPS 115 Capital Adequacy: Insurance Risk Charge* (GPS 115) related to the capital treatment of reinsurance. Under GPS 115 and GPS 116, certain reinsurance arrangements may have their capital treatment determined by the Appointed Actuary without requiring APRA approval, and there may also be interactions between the two standards that affect the capital treatment of reinsurance. Not all the practices outlined in this PPG will be relevant for every insurer and some aspects may vary depending upon the size, complexity and risk profile of the insurer.

Expressions in bold are defined in *Prudential Standard CGPS 001 DefinitionsDefined terms*.

Assessment and management of insurance concentration risk

1) An insurer is exposed to the possibility of very large losses across its portfolio as a result of natural ~~and non-natural~~ perils and/or other accumulations of losses arising from a common dependent source. Such events may occur only rarely and yet their financial impact on the insurer can be very significant, possibly resulting in its failure. This risk is referred to as insurance concentration risk.

2) The ultimate responsibility for ensuring prudent and effective management of insurance concentration risk rests with the **Board** of the insurer. APRA expects the Board to review the insurer's exposure to insurance concentration risk, the effectiveness of the proposed reinsurance arrangements and the residual risk. The Board is expected to use analysis and recommendations from management and relevant experts to assist its understanding of the concentration risk to which the insurer is exposed.

3) The analysis would often include the use of catastrophe models, scenario analysis, stress testing, advice and analysis provided by reinsurance brokers or reinsurers, and regional specific information (such as meteorological records) that provide a greater understanding of a region and the perils the insurer is exposed to in that region.

4) This analysis is also expected to be used to assess the suitability and adequacy of reinsurance arrangements. The Board is expected to ensure that it understands the shortcomings and weaknesses associated with any modelling used (as explained further in this PPG).

5) The outcomes of the analysis are expected to be considered in the context of the insurer's risk appetite and, in particular, the tolerance set for insurance concentration risk. The tolerance would be based on a range of considerations, including the insurer's **Internal Capital Adequacy Assessment Process** (ICAAP) (e.g. its target capital and access to additional capital), the cost and availability of reinsurance, the insurer's strategy and the Board's general view of an acceptable return period. This tolerance should not automatically be set at the minimum return period set out in GPS 116 (i.e. less than 0.5 per cent probability of occurrence in one year), as this is only the minimum used for regulatory purposes and does not consider the insurer's own circumstances.

6) APRA expects the insurer to regularly review its insurance concentration risk exposure, including the ongoing suitability and adequacy of its reinsurance arrangements, against its risk tolerance.

7) APRA expects the insurer to have in place documented processes and procedures for the Board and senior management to assess and manage the insurer's exposure to insurance concentration risk.

Insurance Concentration Risk Charge

8) The purpose of the Insurance Concentration Risk Charge (ICRC), a component of the prescribed capital amount, is to address an insurer's exposure to concentrations of insurance risk to the extent they are not adequately covered by the value of insurance liabilities and other risk charges. The ICRC is intended to represent the net financial impact on the insurer from a single large event, or a series of smaller events, within a one year period. GPS 116 requires that an insurer make no adjustments to reduce the ICRC for tax. This is because the occurrence of an insurance concentration event may completely erode profit and therefore the tax adjustment may not be realisable.

9) The ICRC is determined using the principles set out in GPS 116. The ICRC of an insurer is the maximum of four components:

   a) natural perils vertical requirement (NP VR) – the net loss to the insurer's portfolio from the occurrence of a single natural perils event. NP VR includes the cost of reinstatement of the reinsurance program. NP VR encourages the purchase of adequate levels of vertical reinsurance cover and requires a contractually agreed reinstatement, where it is typically available, of the entire reinsurance program at the start of the treaty year.[1] A catastrophe bond would be an example of a contract where a reinstatement is not typically available;

   b) natural perils horizontal requirement (NP HR) – the net loss to the insurer from the occurrence of several smaller but significant sized events in a given year. NP HR is intended to be broadly equivalent to the annual aggregate net loss from several events, as this is a significant risk to the capital position of an insurer. NP HR includes the cost of reinsurance reinstatements and an offset for catastrophic losses included in net premiums liability;

   c) other accumulations vertical requirement (OA VR) – the net loss to the insurer from the occurrence of claims from a common dependent source or non-natural perils. OA VR considers all classes of business and all business underwritten in those classes; and

   d) lenders mortgage insurer concentration risk charge (LMICRC) – the net loss from the application of a prescribed three-year economic downturn scenario to any **lenders mortgage insurance** business.

10) Reinstatement of cover is a well-established and widely understood feature of many reinsurance products. In considering whether a reinstatement is typically available, it is appropriate to have regard to whether it is a standard market feature of the reinsurance arrangement being considered. For example, Excess of Loss reinsurance, whether responding on a per risk or per event basis, would generally be expected to include reinstatement as a standard feature. Such reinsurances can reduce an insurer's Insurance Concentration Risk Charge (ICRC) where relevant criteria are met, including reinstatement of cover following a loss. Other forms of reinsurance (such as Stop Loss, Surplus, or Quota Share treaty), do not, by nature, require reinstating following a loss, but may still reduce the ICRC, despite not containing a specific reinstatement condition. There may be circumstances where reinsurance arrangements operate in a manner similar to Excess of Loss reinsurance but are not offered with reinstatement. Catastrophe bonds are an example of such arrangements, where a reinstatement is not typically available.

[1] Under GPS 116 an insurer is not required to have this contractually agreed reinstatement, where it is typically available, if it can demonstrate to APRA that it is not practical or appropriate given the nature of its reinsurance arrangements. Paragraphs ~~71~~77 to ~~76~~83 of this PPG give further guidance on this matter.

~~10)~~11) GPS 116 requires an amount to be determined for each of the components in paragraph 9, unless the amount for one or more of these components is expected to always be materially lower than the amount determined for one of the other components. GPS 116 also sets out that only an insurer providing lenders mortgage insurance needs to calculate the LMICRC. In addition, GPS 116 requires an insurer to recalculate the relevant components of the ICRC when there is a material change in the insurer's business or reinsurance program.

~~11)~~12) For some insurers, the greatest component of the ICRC will be easily identifiable given the portfolio of business underwritten and/or the insurer's reinsurance program. For example, a specialist or mono-line insurer may be able to easily identify one or more components of the ICRC that will always be zero.

~~12)~~13) For other insurers, this identification process may be more difficult. This may be because of the structure of its reinsurance, the mix of business lines or the impact of the occurrence of events throughout the reinsurance treaty year.

~~13)~~14) GPS 116 requires an insurer to demonstrate, where relevant, why the amount for one or more of the components is always expected to be materially lower. An insurer can do this by having documented processes and procedures in place to identify which component(s) of the ICRC are likely to be the major component(s) and need to be calculated throughout the reinsurance treaty year. Those components that are unlikely to be the major component may be calculated on a less frequent basis. It is expected the insurer's process would include an annual review of the components of the ICRC. It is also expected that this process would include consideration of material changes to portfolios underwritten by the insurer (discussed further in paragraphs ~~14~~15 to ~~16~~17). An insurer would typically consider how these changes will impact on the components of the ICRC and therefore the frequency with which the ICRC needs to be calculated or recalculated.

~~14)~~15) It is good practice for an insurer to set triggers and/or thresholds with respect to the components of the ICRC to ensure that impacts arising from material changes result in an appropriate recalculation of the ICRC.

~~15)~~16) Examples of material changes may include:

a) the purchase, or sale, of a portfolio of business from, or to, another insurer;

b) the merger of two businesses;

c) new product lines or large additional single policy exposures;

d) securitisation of insurance liabilities;

e) an insurer being placed in run-off; and

f) the cancellation or purchase of additional layers of reinsurance during the reinsurance treaty year.

~~16)~~17) Claiming on the reinsurance program during the year due to a loss is not, in itself, likely to be a material change. If the reinsurance is not replaced, however, it may result in one of the other components of the ICRC having the highest value. For example, the occurrence of an event may result in NP VR needing to be recalculated and it may become the highest component.

~~17)~~18) The recalculation process would typically involve the insurer initially reviewing each relevant component of the ICRC to ensure that it is no longer materially lower than the other components.

~~18)~~19) The recalculation of the ICRC components is expected to be determined and applied by the insurer from the date of the material change. The insurer is expected to notify its APRA Responsible Supervisor of the change in the ICRC and then reflect the new ICRC in the APRA reporting forms at the next **reporting date**.

~~19)~~20) Where a recalculation of NP HR is required, GPS 116 requires an insurer to agree with APRA the method to determine NP HR. APRA expects the insurer to outline the impact of the material change on the insurer's exposures to a series of significantly sized events and whether there are any planned changes in the reinsurance program. The recalculated NP HR would be reported at the next reporting date and then held constant until the end of the catastrophe reinsurance treaty year.

~~20)~~21) Attachment 1 sets out a worked example of the calculation of the ICRC for a diversified (non- LMI) insurer. This example demonstrates the component that drives the ICRC may change throughout the year and emphasises the importance of considering the factors outlined in this section.

Whole-of-portfolio approach

~~21)~~22) GPS 116 requires an insurer to take a whole-of-portfolio approach to determining the natural perils vertical and horizontal requirements. This whole-of-portfolio approach encourages the purchase of adequate levels of vertical reinsurance cover for an insurer with exposures to potential losses in multiple regions.

~~22)~~23) GPS 116 defines whole-of-portfolio as 'an estimation approach that takes into account all possible perils in all geographic regions to determine the size of loss that could occur from a single event, at a certain exceedance probability for an insurer's portfolio. The time horizon to be considered is one year. For clarity, this does not assume that two or more events occur in the same year'.

~~23)~~24) To demonstrate the principle of using the whole-of- portfolio approach, consider this example. A diversified insurer is exposed to an event loss of at least $1 billion in Sydney with a 0.5 per cent probability of occurrence in a year and is also exposed to an event loss of at least $1 billion in Melbourne with a 0.5 per cent probability of occurrence in a year. These events are considered to be independent. The overall probability of an event loss in a year (in either Sydney or Melbourne) of at least $1 billion occurring for this insurer is therefore closer to 1 per cent. The insurer would thus need to purchase reinsurance cover to a level greater than $1 billion, if it is to limit the risk of suffering losses in excess of its reinsurance cover to only 0.5 per cent in a year.

Calculation methods

~~24)~~25) APRA notes there are a number of methods an insurer may use to satisfy the whole-of-portfolio requirement. Methods include:

a) simulation/dynamic financial analysis approaches;

b) aggregation of single peril loss exceedance curves;

c) aggregation of single peril losses; and/or

d) blending of experience and exposure models.

Attachment 2 sets out further details on each of the above calculation methods.

Additional considerations

~~25)~~26) GPS 116 requires the whole-of-portfolio approach to include exposures from all classes of business and all natural perils, regardless of whether these are included in the catastrophe models used. In particular, an insurer is expected to adjust for non-modelled perils, as well as considering non-modelled classes of business and any non-modelled risks such as post-event loss amplification effects, including demand surge and claims inflation.

~~26)~~27) APRA expects the insurer to critically assess the extent to which modelling outputs produce an adequate outcome for all return periods. In this assessment an insurer would typically consider:

a) historical experience data from both internal and external sources;

b) advice from the external model provider or the reinsurance broker regarding the capability of the model to estimate losses at various return periods;

c) an assessment carried out by qualified and experienced staff of the insurer as to the capabilities and/or shortcomings of the model; and

d) advice from the Appointed Actuary or other experts on the adequacy of the data inputs and the model outputs.

~~27)~~28) The outcome of this assessment is likely to establish whether an adjustment is required to be added to the modelled outcomes to ensure the overall estimate meets the relevant return period. Where model outputs are considered insufficient, APRA expects the insurer will use industry or its own historical experience data to estimate the required adjustment.

~~28)~~29) GPS 116 requires an insurer to adjust for potential growth in the portfolio when determining gross losses. APRA expects the insurer will consider the potential for portfolio growth when setting its gross whole-of-portfolio loss at the start of the year. The growth assumptions adopted are expected to be broadly consistent with those outlined in business plans and budgets, and it is good practice for these to be tested regularly against actual growth for key regions on a regular basis. Throughout the year, an insurer is expected to monitor actual portfolio growth against assumptions and consider whether additional capital or reinsurance is required to ensure the relevant loss amount does not materially understate the actual exposures of the insurer.

Net whole-of-portfolio approach

30) GPS 116 requires an insurer that has exposures to natural perils to consider the whole-of-portfolio loss on a 'gross basis' as well as 'net basis' (the latter is defined in GPS 116 as net whole-of-portfolio loss). The gross basis requires the insurer to determine the gross whole-of-portfolio loss on a stand-alone basis and then, as a second step, apply any reinsurance program to determine potential reinsurance recoverables and therefore the net retained loss. The net basis requires the insurer to assess the distribution of net retained losses directly at the relevant exceedance probability.

~~29)~~31) The net basis differs from the gross basis in how reinsurance is applied. The gross method identifies the worst-case event before reinsurance and then applies the reinsurance program to that single event. This works well when reinsurance applies consistently across all types of catastrophic events. In contrast, the net method applies reinsurance to every simulated catastrophic event first, capturing differences in reinsurance coverage by region or peril, and then determines the largest retained loss at the required probability level.

~~30)~~32) These two approaches will arrive at the same outcome if the entirety of the catastrophe reinsurance program of the insurer protects it against all perils in all regions. It will, however, result in differing figures if the insurer has, for example, purchased layers of reinsurance that do not protect the entire portfolio for each risk, or have different retentions on its reinsurance program across its portfolio.

33) In other words, the net retained loss calculated under the gross basis may not adequately reflect the distribution of net retained losses of an insurer, due to the structure of its reinsurance program for different perils or regions.

~~31)~~34) Under GPS 116, an insurer that has reinsurance arrangements with basis risk[2] that respond to NP VR or NP HR must use the net basis to calculate those scenarios.

~~32)~~35) Under GPS 116, an insurer is not required to calculate both the gross and net basis if it is able to demonstrate that the net retained loss estimated from one of these approaches would always be materially lower than, or identical to, the amount determined for the other approach. An insurer can demonstrate this by having a documented process for the assessment of the reinsurance program and the potential for any differences between the net retained loss under the gross and net bases.

~~33)~~36) The net whole-of-portfolio loss can be determined in a similar manner to the methods used to determine the whole-of-portfolio loss, but with the reinsurance program included in the calculation. As such, both simulation-based approaches and analytical approximation methods can be used to determine the net whole-of-portfolio loss. Further details on these methods can be found in Attachment 2 of this PPG.

[2] As defined in GPS 116.

Natural perils vertical requirement

~~34)~~37) The NP VR is intended to represent the net financial impact on an insurer of a single extremely large natural peril event. This is calibrated such that the loss arising from the event is not less than the whole-of-portfolio annual loss with a 0.5 per cent probability of occurrence. The NP VR is calculated by determining the greater of the gross whole-of-portfolio probable maximum loss less potential reinsurance recoverables (gross basis) and the net whole-of-portfolio loss (net basis), and then adjusting this for reinstatement premiums, reinstatement costs, ~~and other APRA-approved~~ adjustments based on the Appointed Actuary's advice or adjustments as approved by APRA. If an insurer has reinsurance arrangements that respond to the NP VR and have basis risk, it must use the net basis to calculate the NP VR.

~~35)~~38) GPS 116 requires an insurer to calculate and report its NP VR to APRA at each reporting date. At this calculation point, the insurer is required by GPS 116 to consider the reinsurance program in place for the next reporting period. This ensures the NP VR is forward-looking and, unless an event occurs during the next reporting period, is relevant to the entirety of the next reporting period of the insurer.

~~36)~~39) APRA notes that reinsurance programs typically renew close to, or on, the last day of a reporting period (e.g. 30 or 31 December) or close to, or on, the first day of the reporting period (e.g. 1 or 2 January). For the purposes of GPS 116, APRA considers renewing on these dates to be effectively renewing on the reporting date and the insurer would determine the NP VR based on that renewing reinsurance program. If an insurer has a program that renews on a day other than very close to or at the reporting date, it is expected to agree with APRA the approach to determine the NP VR at each reporting date. APRA expects an insurer to determine the NP VR based on reviewing both reinsurance programs and provide a rationale for the NP VR that will apply at the reporting date.

~~37)~~40) GPS 116 also requires an insurer to monitor the level of NP VR during the reporting period. This is because the occurrence of an event may impact the level of NP VR, due to changes in the reinsurance retentions and/or reinsurance costs. APRA envisages an insurer will have a documented process for the ongoing monitoring of the NP VR. This process would typically include:

a) pre-determined thresholds, such as the size of a catastrophic event or percentage growth levels, that trigger review of the determined NP VR;

b) calculation procedures to determine the change (if any) to NP VR;

c) procedures for review of the portfolio of business and/or the adequacy of the reinsurance program, and options for reducing the NP VR if this is outside of the Board's risk appetite, such as limiting additional business written, additional reinsurance reinstatements and/or higher reinsurance limits; and

d) notification procedures to advise stakeholders, such as senior management, the Board and APRA.

Adjustments to NP VR based on the Appointed Actuary's advice

41) Under GPS 116 an insurer may reduce its NP VR due to potential reinsurance recoverables from Group B reinsurance[3] cover. GPS 116 requires the insurer to seek advice from the Appointed Actuary to determine a

[3] As defined in GPS 116.

method for calculating these potential recoverables. Further details on this requirement are included in Attachment 3.

Other adjustments to NP VR as approved by APRA

~~38)~~42) Under GPS 116, an insurer may apply to APRA to recognise an adjustment to the NP VR, including potential reinsurance recoverables from ~~aggregate~~ Group C reinsurance[4] cover. ~~Aggregate reinsurance cover is eligible to be considered for inclusion in the determination of NP VR once the aggregate reinsurance cover has reached its attachment point, or will do so as a result of the next event. The insurer may consider the contribution of attritional losses, to reaching the attachment point of the aggregate cover, where relevant, when proposing a methodology.~~

~~39)~~43) An application to APRA under this provision would typically include:

a) a description of the Group C ~~aggregate~~ reinsurance cover, including eligible events and/or losses, retention, limits, exclusions, and interaction of the cover with the insurer's catastrophe reinsurance program; and

b) the proposed level of recognition of the Group C ~~aggregate~~ reinsurance cover within the NP VR over the reinsurance treaty year~~ – that is, as the claims that contribute towards the aggregate reinsurance cover approach the retention, during the period where the insurer can claim on the cover, and as the relevant claims approach the limit of cover~~.

~~40)~~44) APRA will review the formal submission for the recognition of the ~~aggregate~~ Group C reinsurance cover in the determination of NP VR. APRA will notify the insurer, in writing, the adjustment (if any) to be used for determining the insurer's NP VR over the term of the ~~aggregate~~ Group C reinsurance cover.

Reinstatement costs

~~41)~~45) Guidance in relation to the cost of reinstatements for the calculation of the NP VR can be found in paragraphs ~~77~~84 to ~~81~~89 of this PPG.

[4] As defined in GPS 116.

Natural perils horizontal requirement

42)46) The NP HR is intended to represent the net financial impact on an insurer of a series of smaller, but still significantly sized, natural peril events. This is calibrated to broadly replicate the aggregate annual net catastrophic loss with a 0.5 per cent probability of exceedance. Rather than requiring the calculation of the aggregate annual net catastrophic loss, NP HR is structured in the form of two simple one-year scenarios with a fixed number of events of a given severity. The NP HR is calculated by determining the greater of the H3 or H4 requirement (the relevant loss on a gross or net basis adjusted for ~~aggregate~~ reinsurance recoverables, reinstatement premiums and reinstatement costs) less the allowance for relevant catastrophic losses in the net premiums liability (the 'PL offset').

43)47) Under GPS 116, an insurer is not required to calculate both the H3 requirement and H4 requirement if it is able to demonstrate that one of these would always be materially lower than the amount determined for the other component. An insurer can demonstrate this by having a documented process to identify which component is greater based on the size of the gross losses and the relevant potential reinsurance recoverables.

44)48) GPS 116 requires an insurer to calculate NP HR at the reporting date on or prior to the start of the catastrophe reinsurance treaty year and to hold it constant until the end of the reinsurance program. As noted in paragraph 38, reinsurance programs typically renew close to or on the reporting date and therefore NP HR is likely to be calculated at the same time as the insurer is finalising the majority of its reinsurance program. For example, if the reinsurance program starts on 1 July, the relevant calculation date will be 30 June and NP HR will be held constant and then recalculated again at 30 June the following year. If an insurer has a program that renews on a day other than very close to or at the reporting date, it is expected to agree with APRA the approach to determine NP HR.

H3 and/or H4 adjustments based on the Appointed Actuary's advice

49) Under GPS 116 an insurer may reduce its H3 loss and/or H4 loss due to potential reinsurance recoverables from Group B reinsurance cover. GPS 116 requires the insurer to seek advice from the Appointed Actuary to determine a method for calculating these potential recoverables. Further details on this requirement are included in Attachment 3.

H3 and/or H4 ~~aggregate offset~~ adjustments as approved by APRA

45)50) Under GPS 116 an insurer may reduce its H3 loss and/or H4 loss due to potential reinsurance recoverables from ~~aggregate~~ Group C reinsurance cover. GPS 116 requires the insurer to obtain APRA approval ~~agree the methodology with APRA~~ for these potential recoverables. The insurer may consider the expected contribution of attritional losses, to reaching the attachment point of the ~~aggregate~~ Group C cover in its methodology, where relevant.

46)51) An application to APRA under this provision would typically include:

a) a description of the ~~aggregate~~ Group C reinsurance cover, including eligible events and/or losses, retention, limits, exclusions, and interaction of the cover with the insurer's catastrophe reinsurance program;

b) a detailed calculation of the expected H3 and/or H4 requirement and its components;

c) a demonstration there is no overlap or double-counting of the ~~aggregate~~ Group C reinsurance cover in this offset and the PL offset; and

d) the proposed level of recognition of reinsurance recoverables under the ~~aggregate~~ Group C reinsurance cover for the NP HR.

~~47)~~52) APRA will review the formal submission for the methodology to include ~~aggregate~~ Group C reinsurance cover in the determination of NP HR. APRA will notify the insurer, in writing, the methodology to be used for determining the insurer's NP HR over the term of the ~~aggregate~~ Group C reinsurance cover.

Premiums liability offset

~~48)~~53) ~~Premiums liability offset 48.~~ Under GPS 116, an insurer may offset its H3 requirement and/or H4 requirement for the portion of losses expected in the NP HR scenarios that are also included in the net premiums liability of the insurer. This PL offset is determined by the Appointed Actuary and is the annualised net central estimate of the net premiums liability plus its risk margin and Insurance Risk Charge arising from accumulations of exposures to catastrophic losses. It includes all components of the central estimate and risk margin, with the exception of future reinsurance costs.

~~49)~~54) APRA notes the threshold for the size of catastrophic losses within the premiums liability and the scenarios used in the NP HR are interlinked. The calibration by APRA between these two components results in the requirement in GPS 116 that the Appointed Actuary consider events with a return period of at least three months to be classified as catastrophic losses. The Appointed Actuary must (under GPS 116) consider historical data over an appropriate period of time. It is good practice for the Appointed Actuary to consider other information from the insurer or other external sources. It would not be prudent for the Appointed Actuary to rely solely on outputs or results from catastrophe or internal models when determining the catastrophic losses threshold.

~~50)~~55) An Appointed Actuary may choose to use a return period that is longer than three months (e.g. one year) if this is consistent with the approach taken in the valuation of premiums liability.

~~51)~~56) For an insurer experiencing low and steady portfolio growth, APRA envisages the annualised amount of net premiums liability central estimate for catastrophic losses would simply be double the amount reported at the relevant reporting date. However, this adjustment may not be appropriate for an insurer with:

a) high or declining portfolio growth rates (e.g. a newly licensed insurer or an insurer in run-off); or

b) material seasonality in the portfolio due to peak renewal periods or the seasonality of risk exposure of the particular class of business. An adjustment should be made for these, or other relevant factors, when annualising the net central estimate.

~~52)~~57) Under GPS 116, the risk margin for the purposes of determining the PL offset for NP HR is the margin determined by the Appointed Actuary as part of the insurance liability valuation. GPS 116 notes that the

Appointed Actuary does not need to split the risk margin into a catastrophic and attritional loss component. APRA expects that if such a split is made the PL offset would not increase as a result.

~~53)~~58) GPS 116 requires the Appointed Actuary to include details of the determination of the PL offset in the ~~Insurance Liability~~Actuarial Valuation Report (~~ILVR~~AVR). The commentary by the Appointed Actuary in the ~~ILVR~~ AVR would ~~tyically~~typically include:

a) the data used in the determination;

b) the approach taken to set the threshold level for catastrophic losses, and the resulting split of the net premiums liability by class of business;

c) any limitations that have impacted the setting of the PL offset; and

d) the sensitivity of the determined offset to the underlying assumptions.

Reinstatement costs

~~54)~~59) Guidance in relation to the cost of reinstatements for the calculation of NP HR can be found in paragraphs ~~77~~84 to ~~81~~89 of this PPG.

Other accumulations vertical requirement

Other accumulations probable maximum loss

~~55)~~60) APRA expects the whole-of-portfolio principles to be applied to exposures to other accumulations to calculate the other accumulations probable maximum loss (OA PML). GPS 116 requires an insurer to determine the largest loss across all of its classes of business and business written in those portfolios. APRA expects the insurer to consider the effect of multiple claims arising from a common dependent source.

~~56)~~61) APRA notes that for exposures to ~~non-natural perils and~~ other accumulations from a common dependent source, a probable maximum loss can be difficult to define and to incorporate into traditional modelling techniques such as catastrophe models. In determining the probable maximum loss for such exposures, GPS 116 requires an insurer to consider:

a) the nature of the insurance products provided;

b) the losses that may lead to an aggregation of multiple per-risk or per-policy losses arising from a common dependent cause (whether that cause may occur either once at a point in time or arise over an extended period);

c) the potential for multiple classes of insurance and/or portfolios to be impacted from a common dependent cause; and

d) whether the upper limit and/or reinstatements of reinsurance cover purchased is sufficient to cover the probable maximum loss.

62) Under *Prudential Standard GPS 230 Reinsurance Management* an insurer must document the details of the scenario that drives the OA VR and method used to determine the scenario where the regulated institution's ICRC is not driven by natural perils in its **Reinsurance Arrangements Statement** (ReAS).

~~57)~~63) APRA expects an insurer to explicitly consider a range of possible maximum event scenarios that are relevant to its own particular circumstances when determining the OA PML and the commensurate OA VR. This process is an important factor in the overall risk identification and management process of an insurer. It is not sufficient to set the OA VR by only referring to the per-claim excess-of-loss reinsurance retention or aggregate stop-loss reinsurance retention as this does not consider the gross exposure of the insurer.

~~58)~~64) When developing possible maximum event scenarios for its portfolio, an insurer is expected to consider historical experience as well as hypothetical scenarios. For example, factors such as the impact of an economic downturn; potential non-natural peril events such as terrorist attacks and pandemics; the impact of class actions or similar legal actions on liability classes; the effect of external developments like medical advancements on relevant classes; and consequences of a major occurrence such as the closure of an air or seaport, are expected to be considered, as appropriate, for the classes of business written, to arrive at plausible scenarios that are relevant to the insurer.[5]

[5] Plausible scenarios may include scenarios that an insurer considers have been sufficiently captured in other risk charges. For example, an economic downturn may be substantially covered by the insurer's asset and/or insurance risk charges. Where an insurer decides to adjust or omit a scenario on this basis, APRA expects the insurer to demonstrate the rationale for the decision, including discussion of the capital held within its prescribed capital amount for the relevant scenario.

~~59)~~65) An insurer, when working through the financial impact of the scenarios, is expected to consider whether reinsurance would be available to purchase. Assuming reinsurance capacity is available, the insurer is able to include relevant reinsurance recoverables in the future period, as long as the cost of that reinsurance is captured within the determination of the financial impact of the event.

~~60)~~66) Under GPS 116, certain adjustments may be made to the OA PML or OA reinsurance recoverables (as defined in GPS 116) to determine the OA VR. These adjustments allow (where appropriate) for:

a) losses that are already included in the net premiums liability provision in respect of the event or loss scenario being considered; and

b) stop-loss reinsurance protection.

~~61)~~67) For some limited classes of business, there may be circumstances when the maximum loss event (i.e. OA PML) will include working/attritional losses that were envisaged when setting the premiums liability provision. The severity and potential impact of the maximum loss event, however, would be greater than the losses envisaged in the premiums liability scenarios. Examples of such cases include an insurer that writes trade credit or consumer credit insurance, where the maximum loss scenario considered relates to an economic downturn. When this event occurs, some provision will be included in premiums liability provisions for losses related to the downturn scenario as those losses emerge. In such circumstances, some double-counting of risk may occur if losses contributing to the event are considered in both OA PML and the premiums liability provision. Under GPS 116, an insurer may adjust its OA PML (downwards) in such circumstances to ensure there is no double-counting of risk. The amount of adjustment is required to be calculated by the Appointed Actuary and addressed in the ~~ILVR~~ AVR. APRA will, as part of normal supervisory processes, review any adjustment made by the insurer and may require the insurer to modify the adjustment.

~~62)~~68) The adjustment in paragraph 67~~61~~ does not necessarily apply for all classes of business. For example, in medical indemnity and other liability classes, it may not be reasonable to assume the claims in the premiums liability provision overlap significantly with the claims represented in the maximum event scenario. Also, the potential double-counting of risk would not necessarily always apply to the insurer and could depend on its particular circumstances. For example, during times of economic prosperity, there would be expected to be little or no overlap between the premiums liability provision and the maximum event scenario for an insurer that writes trade credit or consumer credit insurance.

OA reinsurance recoverables

~~63)~~69) There may be circumstances where an insurer has in place aggregate stop-loss reinsurance arrangements that will have an impact on OA VR. In particular, a portion of paid and outstanding claims and premiums liability may contribute to an insurer's retained losses as defined in the reinsurance agreement. Under GPS 116, an insurer may include a portion of paid and outstanding claims and premiums liability as contributing to the attachment point of the aggregate stop-loss reinsurance. GPS 116 requires this adjustment, that together with the adjustment in paragraph 67~~61~~, must not result in the relevant premiums liability being deducted twice. APRA will, as part of normal supervisory processes, review any adjustment made by the insurer and may require the insurer to modify the adjustment.

Exposures to multiple events

~~64)~~70) As a practical measure, there is no component of the ICRC for the occurrence of several smaller size events in a given year for exposures to other accumulations. This is because of the nature of these types of exposures and the manner in which the insurer arrives at the scenario that drives OA VR. For example, if the 'event' for an insurer is a series of multiple claims from a common dependent source, the probability of a series of these multiple claims in a year would be much less than 0.5 per cent. Likewise, if the 'event' occurs over an extended period such as an economic downturn, the probability of a series of downturns in one year would be much less than 0.5 per cent.

~~65)~~71) However, the assumption that a series of events will not occur over a year does not hold for certain exposures or classes of business. Therefore, GPS 116 requires the Appointed Actuary to review and comment in the **Financial Condition Report** (FCR)[6] on the exposure of the insurer to multiple non-property events in a year and whether or not they would materially alter the determination of the ICRC. If there would be a material impact, APRA may apply a supervisory adjustment. The application of a supervisory adjustment would be in accordance with APRA's normal supervisory processes. Further detail on supervisory adjustments can be found in *Prudential Practice Guide CPG 110 Internal Capital Adequacy Assessment Process* and supervisory review.

[6] Under GPS 116, the Group Actuary of a Level 2 insurance group must include this commentary in the ~~ILVR~~AVR.

Lenders mortgage insurer concentration risk charge

Net premiums liability deduction

~~66)~~72) GPS 116 requires the Appointed Actuary to determine the percentage of a lenders mortgage insurer's net premiums liability that relate to an economic downturn. This portion of net premiums liability is deducted from the LMICRC. GPS 116 also requires the Appointed Actuary to comment in the ~~ILVR~~ AVR on the methodology used to determine the percentage.

~~67)~~73) The calculated percentage is intended to recognise that some of the losses contained within the prescribed stress scenario may also be included in the insurer's net premiums liability. APRA has deliberately not set a threshold limit for this deduction, as the deduction is expected to vary throughout the economic cycle. APRA expects the value used by an individual insurer at any point in time will vary depending on factors such as the Appointed Actuary's approach to provisioning and economic factors used in the valuation approach. The value across the industry, however, is expected to be within a reasonably limited range and APRA intends to monitor the level used by the industry as part of normal supervisory processes.

~~68)~~74) As part of the determination of the percentage, the Appointed Actuary may also wish to set a methodology for the insurer to adjust the percentage throughout the financial year, until the next full insurance liability valuation. This methodology may consider a material change in the portfolio, such as significant growth or decline in the business written, a major economic event, change in the reinsurance program or change in economic factors.

~~69)~~75) The commentary by the Appointed Actuary in the ~~ILVR~~ AVR on the methodology to determine the percentage would typically include:

a) the data used;

b) analysis of the percentage(s) used in the previous year;

c) the approach taken to split the net premiums liability to arrive at the determined percentage;

d) any limitations that have impacted the setting of the percentage; and

e) the sensitivity of the determined percentage to underlying assumptions.

Reinsurance arrangements

Calculation of gross and net amounts

76) Where GPS 116 requires an insurer to determine NP PML, H3 loss and H4 loss gross of potential reinsurance recoverables~~. Therefore,~~ the insurer must (under GPS 116) determine these amounts gross of potential catastrophe reinsurance recoverables as well as potential reinsurance recoverables from other reinsurance arrangements, such as risk excess-of-loss, proportional or facultative reinsurance. Where it is not possible for the insurer to determine these amounts gross of all potential reinsurance recoverables, the insurer is expected to consult with APRA to agree on an appropriate manner in which to determine NP PML, H3 loss and/or H4 loss.

Contractually agreed reinstatement

~~70)~~77) GPS 116 requires an insurer to have, at the inception date of its catastrophe reinsurance program, a contractually agreed reinstatement of the catastrophe reinsurance arrangements that reduce the NP VR where it is typically available. This requirement ensures that, after a catastrophic event, the insurer will have access to reinsurance protection. The terms of the reinsurance agreement may include the prepayment of the reinstatement or an agreed price/ rate for the reinstatement. This means the cost of the reinstatement of cover would be known.

~~71)~~78) APRA expects an insurer to take appropriate measures to ensure the reinsurance program placed contains the required contractually agreed reinstatement. There may, however, be circumstances where the insurer has not placed this requisite reinstatement. These circumstances could include:

a) non-availability of cover for a particular layer(s) of the overall program, whether for the first or subsequent events;

b) where cover is available but at a commercially unacceptable cost;

c) use of reinsurance cover that only protects the insurer's capital position for the first event and a reinstatement is not readily available or too expensive; and

d) use of non-traditional reinsurance placements (such as catastrophe bonds or capital market structures).

An insurer that does not have a contractually agreed reinstatement of its catastrophe reinsurance program, because it is not typically available, must set out its approach to managing the risk associated with not having a contractually agreed reinstatement of cover in its Reinsurance Management Strategy (ReMS).

79)

~~72)~~80) ~~GPS 116,~~Where a contractually agreed reinstatement is required under GPS 116, ~~requires~~ an insurer that does not have the required reinstatement ~~to~~ must demonstrate to APRA why it is not practical or appropriate given the nature of the reinsurance arrangements. Where an insurer has not placed reinsurance with a contractually agreed reinstatement, APRA expects the insurer to:

a) document the layer(s) that do not have a contractually agreed reinstatement and the circumstances and rationale for not placing the reinstatement;

b) document the capital implications of the lack of an agreed reinstatement after the first large event, and how the insurer will either fund the purchase of additional reinsurance in the prevailing market conditions post the large event~~,~~ and also consider how the insurer would ~~or~~ provide capital to meet the exposure created by the absence of the reinsurance cover for a future large loss; and

c) demonstrate the Board has considered the additional risk and the resulting capital implications and has approved and documented that it is within the insurer's risk appetite.

This demonstration could be included in the ~~Reinsurance Arrangements Statement~~ReAS or other internal documents.

~~73)~~81) APRA expects an insurer to document the overall approach to the placement of reinstatements in its ~~**Reinsurance Management Strategy (**~~ReMS~~)~~. In determining whether to apply a supervisory adjustment to the prescribed capital amount in accordance with GPS 116, APRA will consider the overall reinsurance strategy of the insurer, the processes undertaken by the insurer to place its reinsurance, the factors set out in paragraphs ~~72~~78) ~~and~~ to 80)~~73~~ of this PPG, and the resulting capital impact if an event was to occur and the insurer has an additional exposure to a large loss.

~~74)~~82) GPS 116 requires an insurer with multiple inception dates for its catastrophe reinsurance program to consult with APRA on the approach to be used in the determination of NP VR for the contractually agreed reinstatement for the relevant inception date. APRA expects the inception date the insurer would typically use is where the majority (by limit) of the program commences. APRA will, however, consider whether the impact of this approach is to reduce the use of reinstatements as this would compromise the overarching requirement of GPS 116.

~~75)~~83) Irrespective of whether the reinstatement has been contractually agreed, the insurer is required under GPS 116 to include the cost of the reinstatement in the calculation of the relevant component of the ICRC. If an insurer is unable to reasonably estimate the cost of the reinstatement, it is expected to not include the relevant reinsurance layer as reducing the probable maximum loss.

Reinstatement costs

84) NP VR, NP HR and OA VR include provision for the costs of reinstatement of reinsurance cover, irrespective of whether the reinsurance cover has or will be placed. This inclusion ensures the insurer has set aside capital to place additional reinsurance to protect the portfolio after the occurrence of the relevant event. Where the reinstatement is not contractually agreed, GPS 116 requires an insurer to estimate the cost of reinstating cover based on the reinsurance market conditions. For NP VR and OA VR, these reinsurance market conditions are those that prevail at the time of the calculation of the ICRC component. For NP HR, as this is calculated at the start of the year, the insurer is required under GPS 116 to consider the market conditions that would prevail after the occurrence of the requisite number of events.

85) For reinsurance arrangements that typically do not have a reinstatement:

a) For NP VR, reinstatement costs are not required.

b) For NP HR, reinstatement costs are required where the insurer assumes that the cover will be reinstated and used to provide protection against future events. For example, if the reinsurance is exhausted by the

first event in the H3 or H4 scenario and it is assumed it will be reinstated and provide reinsurance recoveries for the second or other future events, an estimate of the cost of reinstating cover must be included.

~~a)~~c) For OA VR, allowance for the cost to replace reinsurance is required and insurers should continue to engage with APRA to make adjustments in cases where reinsurance arrangements that typically do not have a reinstatement are used.

~~76)~~86) APRA expects an insurer to have in place a documented process to determine the relevant reinstatement cost, where the reinstatement is not placed. This process would typically include:

a) assessment of which layers of the catastrophe reinsurance program are impacted, including any layers that would be partially claimed upon;

b) determination of whether these layers have further contractually agreed reinstatements, and therefore the cost (if any) is known;

c) consideration and quantification of the impact of the market conditions on the cost of the reinsurance; and

d) procedures for estimating the total cost of the reinstatement cover, including consideration of the requirements of GPS 116 in relation to the use of a minimum level and whether this minimum is an understatement of the actual cost.

~~77)~~87) GPS 116 sets a minimum level for the reinstatement cost, based on the original cost of cover. The original cost of cover is the full cost of the reinsurance cover at the start of the catastrophe reinsurance treaty year. This may include instances where the original cost of cover has effectively included a pre-paid reinstatement. APRA considers the original cost to be an appropriate minimum for the estimated cost of reinstating the cover. The insurer, however, is expected to determine the expected cost of reinstating cover after the occurrence of an event. This could vary quite significantly, due to a number of factors including:

a) the overall insurance and reinsurance market conditions, including availability of reinsurance;

b) the insurer's relationship with the reinsurer(s);

c) the timing and size of the event; and

d) the level of protection provided by the original cover.

~~78)~~88) Where an insurer considers the original cost of cover to be a material overstatement of the estimated cost of reinstating reinsurance cover after the next event, the insurer is permitted under GPS 116 to use a lower amount. GPS 116 requires the insurer to demonstrate this overstatement to APRA in order to reduce the relevant reinstatement cost (i.e. NP reinstatement cost, H3 reinstatement cost H4 reinstatement cost or OA reinstatement cost). The information provided to APRA would typically include:

a) reasoning why the insurer considers the original cost of cover to be a material overstatement of the cost of reinstating cover;

b) the total cost of the original cost of cover compared with the insurer's estimate of the cost based on current reinsurance market conditions;

c) the risks and potential capital implications of choosing a lower estimate of the cost of reinstating reinsurance cover; and

d) how the capital resources of the insurer will meet the reinstatement if the cover is not placed.

~~79)~~89) For NP HR, the inclusion of the cost of reinstating reinsurance cover after the first two (H3) or three (H4) events ensures the full financial impact of the occurrence of a series of events is included. APRA notes that it will be particularly difficult for an insurer to estimate this cost at the start of the treaty year as the events will not have occurred. APRA, however, expects the insurer to take into account the market conditions that would prevail after the occurrences of the events and determine a prudent amount for the estimated cost of reinsurance. This would include consideration of historical experience and other information available to the insurer.

~~Alternative~~ Other ~~capital and~~ risk mitigants

~~80)~~90) GPS 116 requires an insurer to seek APRA's approval to include ~~alternative capital or~~ risk mitigants that are not considered elsewhere in GPS 116 in the calculation of the ICRC. ~~Alternative capital and risk mitigants for the purposes of GPS 116~~This includes, but ~~is are~~ not limited to, securitisation of insurance liabilities.~~:~~

~~a) securitisations of insurance liabilities - where an insurer transfers a portion of their insurance liabilities to a **Special Purpose Vehicle**;~~

~~b) reinsurance premium protections[7] – purchase of a reinsurance product under which the payment of the reinstatement costs for particular reinsurance layers is made by the counterparty to the reinsurance premium protection;~~

~~c) capital market structures – capital protection where the insurer accesses funding from capital markets as an alternative to traditional reinsurance markets. There are a number of capital structures in the markets an insurer can access and APRA will look through the entire structure as part of the assessment; and~~

~~d) catastrophe bonds – an alternative risk product where the insurer receives payment to a certain limit, usually from structured debt instruments, in the event of a predefined catastrophe-related 'trigger'.~~

~~At this stage, APRA does not expect to approve credit in the ICRC for products where the 'trigger' in the arrangement is based solely on a parametric measure. This is because these types of products may carry a material risk to the insurer that the product will not respond to reduce the gross exposure/loss of the insurer.~~

Documentation

~~81)~~91) APRA expects an insurer to provide APRA with all relevant information and as close to final documentation regarding the arrangement, to enable APRA to make an informed decision regarding the amount of credit to be recognised in the ICRC. The information provided would typically include:

a) a description of how the arrangement fits with the insurer's wider reinsurance program and within the insurer's risk appetite and ReMS;

b) documentation of the consideration and approval of the proposed arrangements by the appropriate delegated level of management, or the Board;

c) a description of the key features of the arrangement and how it works from end-to-end (i.e. how the arrangement responds before, during and after an event);

~~[7] APRA notes that reinsurance premium protections usually take the form of traditional reinsurance and may therefore not be considered by an insurer to be 'alternative capital and risk mitigants'. Nonetheless, GPS 116 requires these products to be referred to APRA for approval to reduce the ICRC until such time as APRA is comfortable with the type and details of the individual products used by the insurer. An approval by APRA for the use of reinsurance premium protections may cover more than one individual contract.~~

d) justification for the use of the arrangement and the insurer's proposed methodology for recognition of the arrangement;

e) documentation of the insurer's understanding of the risks associated with the arrangement, including consideration of coverage exclusions, claims notification period limits, early termination events and commutation provisions, as well as counterparty and legal issues;

f) description of the counterparties involved, including their credit standing;

g) details of any collateral arrangements;

h) draft (but close to final) contract wording for the entire arrangement, including any collateral arrangements;

i) any other documentation or information relevant to the proposal such as a description of any continued negotiations that are material to the operation of the arrangement;

j) the insurer's assessment and estimation of the effect of the arrangement on the ICRC and overall capital adequacy of the insurer, for each reporting period and over the full period of the proposed arrangement. APRA envisages this would include scenario analysis or stress testing for the period of the arrangement. It would also typically include analysis of the impact after the use of the cover and the alternative arrangements that would need to be put in place to mitigate any material change in the ICRC;

k) documentation of any independent review that has been undertaken;

l) where any modelling is involved, the insurer's assessment of the adequacy of the outputs and any ~~basis risk[8] and/or~~ model risk that may be involved; and

m) the requested credit for the ~~alternative capital or~~ risk mitigant.

APRA assessment

~~82)~~92) The time needed for APRA to assess ~~an alternative capital arrangement or a~~ risk mitigants not considered elsewhere in GPS 116 will depend on the type, nature and complexity of the arrangement and the extent to which the arrangement is new or has novel features. If an insurer requires recognition within the ICRC when the product is in place, it is expected to approach APRA well in advance of the commencement date to allow sufficient time for APRA to assess the credit, if any, that will be allowable for the arrangement. Matters that APRA will consider in its assessment include whether:

a) the proposed arrangement has a legitimate purpose and effect, and is not a Limited Risk Transfer Arrangement as defined under *Prudential Standard GPS 230 Reinsurance Management*;

b) the arrangement facilitates the timely finalisation of all claims payments;

c) the level of basis risk and the quality of coverage that the arrangement provides results in any gaps in coverage that may give rise to future deterioration in claims estimates;

~~[8] Basis risk in this context relates to the possibility the product may not respond despite the insurer having suffered a loss.~~

d) the proposed arrangement will disguise, or is designed to disguise, a material risk to the insurer's current or continuing profitability or capital adequacy;

e) the financial costs and benefits of the proposed arrangement, and the nature and potential quantum of any potential risks to policyholders, are reflected in the application for approval;

f) there will be any adverse effect on the insurer's capital position in any one reporting period or over the entire term of the arrangement;

g) the insurer has reviewed the effect of the proposed arrangement within the context of its overall risk management and control systems;

h) the insurer has demonstrated sufficient level of understanding of the arrangement;

i) the proposed arrangement complies with the requirements of any relevant prudential standards and the *Insurance Act 1973*; and

j) the proposed arrangement will, or will not, adversely affect the interests of policyholders.

Notification

~~83)~~93) APRA will review the formal submission for the recognition of the~~the alternative capital and~~ risk mitigant and will notify the insurer, in writing, of the decision, including matters such as:

a) the amount (if any) of credit the insurer can use in the calculation of the ICRC;

b) the allowable timeframe for use of credit in the ICRC from the proposed arrangement;

c) any further information that APRA requires from the insurer;

d) any additional reporting requirements that APRA will expect from the insurer throughout the period of the arrangement; and

e) where applicable, reasons for the decision to not allow credit for the arrangement.

~~84)~~94) APRA may provide an insurer with approval to use a particular type of ~~alternative capital or~~ risk mitigant ~~(e.g. reinsurance premium protection)~~ without needing to review each and every contract and its associated documentation. This may be subject to criteria or limits.

Review and Reporting

~~85)~~95) GPS 116 requires an Appointed Actuary to comment in the FCR[9] on the adequacy of the insurer's ICRC calculation. This would typically include assessment of:

a) whether the ICRC is consistent with the risk appetite of the insurer;

b) whether the reinsurance cover purchased by the insurer is sufficient to cover the probable maximum loss;

c) the insurer's overall process for determining the ICRC, including the process for identifying the maximum component of the ICRC;

d) the appropriateness of the methodologies used, assumptions made and modelling outputs used by the insurer;

e) where appropriate, the impact on the insurer's ICRC of multiple events in a year where the insurer has exposures to other accumulations; and

~~e)~~f) where an insurer has recognised Group B reinsurance in consultation with the Appointed Actuary, the Appointed Actuary must comment on the adequacy of the adjustments.

[9] Under GPS 116, the Group Actuary of a Level 2 insurance group must include this commentary in the ~~ILVR~~AVR.

Catastrophe models

~~86)~~96) The use of catastrophe models that are developed in-house or provided by external parties is well established in the insurance industry as a means of estimating loss scenarios arising from different catastrophe perils. APRA expects the Board and senior management of an insurer to have a sound understanding of the insurer's approach to the use of models to manage catastrophe risks. This would include an overall understanding of the use of the models, their limitations and their weaknesses. The Board and senior management are expected to understand the uncertainty in the model outputs and the resulting impact this has on key decisions such as reinsurance purchasing and the capital held for catastrophe risk.

~~87)~~97) Catastrophe models used to estimate the financial impact on an insurer are clearly only a representation of the real world. These models will contain explicit assumptions, limitations (e.g. non-modelled perils and elements) and unknown shortcomings. Their usefulness can also be compromised when the quality of the data input is poor. As a result, the difference between the financial impact estimated by a catastrophe model and the actual financial exposure can be quite substantial and the insurer's Board and senior management need to be cognisant of this.

~~88)~~98) APRA expects the insurer's Board and senior management to understand how these weaknesses and uncertainty in the outputs from catastrophe models can impact the effective management of catastrophe risk. It is imprudent for Boards and senior management to use model outputs as the sole source of estimates of catastrophe risk. These outputs are simply a starting point for understanding risk, reinsurance purchase and capital management.

~~89)~~99) APRA expects the Board and senior management to consider other sources of information and analysis in the management of catastrophe risk. This would typically include:

a) advice and any analysis provided by reinsurance brokers or reinsurers;

b) consideration of location specific information, such as meteorological records, that provide a greater understanding of a region and the perils the insurer is exposed to in that region;

c) stress testing of catastrophe model outputs and estimates used by the insurer; and

d) scenario analysis including discussions on the likelihood of various types of events occurring in a particular location.

~~90)~~100) With respect to the use of catastrophe models, APRA expects an insurer to ensure there is a sound process in place, including:

a) an agreed approach to model research, testing and selection;

b) procedures for ensuring the quality of data and other inputs and assumptions used; and

c) analysis of outputs from the model, including level of uncertainty and resulting impact on the understanding of catastrophe risk.

~~91)~~101) GPS 116 requires an insurer using a catastrophe model to ensure that the model is conceptually sound and capable of consistently producing realistic calculations. GPS 116 also sets out requirements in relation to model research and testing, data quality and model understanding.

Research and testing

~~92)~~102) APRA notes there are a number of models available to an insurer to assist in understanding its catastrophic risk. APRA expects an insurer to consider a range of available models, including assessing the merits of using more than one model. When analysing the models, the insurer is expected to explore their strengths and weaknesses and decide on which model (or models) is most appropriate for analysis and quantification of its exposures. The insurer is expected to document the reasoning for its choice of model(s).

~~93)~~103) Once the insurer settles on the model(s) to be used, GPS 116 requires an insurer to be able to demonstrate that the catastrophe model(s) have been adequately researched and tested. APRA envisages an insurer using a catastrophe model from an external provider would document:

a) which model(s) have been chosen and the model versions;

b) a clear rationale for choosing the model(s), including, where relevant, consideration of advice on model selection from brokers or other external advisors;

c) an approach to validating the model(s), including demonstration that the model provider itself understands the environment the insurer operates in and confirms the model is suitable for its intended use; and

d) an understanding of the shortcomings (such as non-modelled elements and assumptions) of the model including how it can impact the model output and how the insurer has attempted to address those shortcomings.

~~94)~~104) Where a model has been developed in-house, it is expected to be reviewed and updated on a regular basis, periodically tested for functionality and be compared against externally available models.

Data

~~95)~~105) Exposure data provided by an insurer is a key input into the catastrophe model. APRA expects an insurer to understand that improving the quality of data provided to the catastrophe model can reduce the uncertainty of model outputs, and so quality of data is a key consideration in the management of catastrophe risk. GPS 116 requires an insurer to take measures to ensure that data used to estimate losses is sufficiently consistent, accurate and complete.

~~96)~~106) APRA expects the insurer's exposure data used as an input into the catastrophe model to be compared across time at a reasonably granular level. The changes in the exposure data inputs and assumptions would typically be tested for consistency with the changes in the catastrophe model output over time. Where inconsistencies are found, it is good practice to document these including reasoning and impact on model outputs.

~~97)~~107) APRA expects the insurer to take appropriate measures to ensure the data provided for the catastrophe model is accurate and of appropriate quality. It is good practice to have clearly defined responsibilities, appropriate controls and documentation surrounding data extraction, data cleansing and mapping from the insurer's systems to the catastrophe model. APRA envisages that data quality issues encountered during the data cleansing and mapping process are made explicit and documented.

~~98)~~108) Where an external provider or intermediary is involved in the process of collecting data, APRA expects the insurer to have policies and procedures in place to ensure the data meets its requirements. The insurer is also

expected to seek feedback from these external parties on the quality of data provided and take measures to address the feedback.

~~99)~~109) It is good practice for the insurer to have processes and controls in place to enable the provision of a complete set of data that is to be used in the catastrophe model. APRA expects the insurer to understand the implications of providing incomplete data as input to the catastrophe model, including that it may lead to an underestimation of risk and inadequate levels of catastrophe reinsurance being purchased.

~~100)~~110) The granularity of the provided exposure data will have an impact on the outputs of the catastrophe model. As an example, location data at street address level provides greater granularity than data provided at postcode level or Cresta zone and can have material implications for flood, bushfire and windstorm modelling. In general, a less granular set of exposure data will mean more assumptions and greater uncertainty in the model output.

~~101)~~111) APRA expects the insurer to understand the limitations of the data used and the level of possible errors in the data. Data limitations can impact the outputs of the catastrophe models and may impact the number of adjustments required to be made to model outputs.

~~102)~~112) It is good practice for data to be subject to periodic review. Typically this would be undertaken by qualified staff or external parties that are independent of the data collection and data quality processes.

Model understanding

~~103)~~113) GPS 116 requires an insurer to be able to demonstrate an understanding of the catastrophe model(s) being used and its limitations, including perils and elements that are not included in the model, assumptions and estimates used, and the sensitivity of model outputs. For example:

a) non-modelled regions and perils – the insurer may be exposed to perils and regions that are not reliably modelled. As an example, the insurer may not have access to sufficiently robust models for hail or bushfire. APRA expects that, where no loss model for particular perils exists, the insurer would use other methods to estimate the likely losses from these perils;

b) non-modelled risks and sources of loss – the insurer may be exposed to losses that are not modelled, such as post-event loss amplification that can arise from demand surge or claims inflation. APRA expects the insurer to consider whether loadings should be added to outputs from the catastrophe models to allow for these types of loss; and

c) non-modelled exposures/lines of business – the insurer may have exposures that fall outside the scope of the model, such as workers compensation claims from an earthquake. Where this is the case, APRA expects the insurer to use other methods to estimate the likely loss, such as consideration of the insurer's own analysis of the impact that natural perils may have on these non-modelled lines of business.

~~104)~~114) In the catastrophe modelling process there are likely to be assumptions and estimates made to help address any shortcomings in the model or in the exposure data provided by the insurer. The assumptions or estimates made in the catastrophe modelling process will vary by insurer. The assumptions and estimates would typically be made clear in a report from either an external source or from the internal catastrophe modelling team. There are a number of factors that may drive the level of assumptions and estimates made, including, but not limited to:

a) the granularity of the exposure data provided for the model;

b) the types of exposures the insurer has and whether they can readily be modelled; and

c) any limitations in the catastrophe model used.

It is good practice for an insurer to clearly define and document any assumptions used or estimates made in the modelling process.

~~105)~~115) The outputs from catastrophe models will have sensitivities to a number of factors, including assumptions and estimates used. In addition, the outputs will not capture perils or elements not contained in the model. As a result, APRA expects outputs from catastrophe models to be used as a base for further analysis and quantification. After considering the factors outlined above, APRA expects an insurer to be able to articulate its view on overall probability of sufficiency with respect to model outputs and to understand areas of sensitivity of the outcomes and overall level of inherent uncertainty in the model outputs. APRA expects an insurer to document its understanding and analysis of uncertainty in the model output.

~~106)~~116) In addition, it is good practice for an insurer to assess model outputs against recent catastrophe events, at relevant return periods, as a reasonableness check of the suitability of model outputs.

Level 2 insurance groups

~~107)~~117) GPS 116 requires a Level 2 insurance group to determine the ICRC components for the group by the use of either a regional method[10], or via application to APRA for a different method that is consistent with the whole-of-portfolio approach and achieves the same level of security to policyholders.

~~108)~~118) Where a Level 2 insurance group chooses to use the regional approach, GPS 116 requires the regions to be agreed with APRA. APRA expects these to be consistent with those used for APRA reporting. The calculation of the ICRC component for a region will need to consider exposures within that region, not necessarily just entities that are located in that region.

~~109)~~119) Where a Level 2 insurance group chooses to use a different method, GPS 116 requires the group to apply to APRA with a detailed description of the method and how the calculated ICRC plus reinsurance arrangements and other resources provide the requisite level of security to policyholders. The application would typically include:

a) a detailed description of the methodology proposed for the relevant components of the ICRC;

b) comparison of the outcomes from the proposed methodology and the regional approach;

c) documentation of approval of the methodology by the relevant group management and/or Board committee;

d) description of how the approach provides at least the same level of security to policyholders as the whole-of-portfolio approach set out in paragraph 7(a) of Attachment B of GPS 116; and

e) any other relevant information to assist APRA in understanding the proposed methodology.

~~110)~~120) APRA will review the formal submission and will notify the Level 2 insurance group, in writing, of the decision, including matters such as:

a) whether the proposed methodology has been approved and any conditions of approval;

b) the timeframe for which the approval is valid, including any review points;

c) any further information that APRA requires from the Level 2 insurance group; and

d) any specific reporting requirements.

[10] For the purposes of Level 2 insurance groups, regional method is as set out in paragraph 7(a) of Attachment B of GPS 116. For clarity, this is different to the use of 'regions' as a generic term in the remaining sections of this PPG.

Attachment 1 – Worked examples of ICRC for a diversified insurer

This Attachment provides worked examples of the calculation of ICRC for a hypothetical diversified Australian insurer that is not part of a Level 2 insurance group. In addition, this insurer does not write lenders mortgage insurance (and therefore the LMICRC is zero).

Examples of the calculation of the components of the ICRC are provided for three scenarios.

For each scenario, there are a number of assumptions made:

Reinsurance

The reinsurance arrangements cover all classes, regions and natural perils; comply with prudential requirements and have a common inception date of 1 January. As a result, the gross and net whole-of-portfolio approaches will result in the same outcome.

The figure below shows the limits and attachment points for the natural perils catastrophe reinsurance program. The program has one full pre-paid reinstatement. The accompanying table includes the contractually agreed cost of reinstating each layer of the program (after the first two covers are exhausted). The catastrophe reinsurance program retention is $20 million.[11]

Figure 1

[11] For the remainder of this Attachment, 'm' will be used as an abbreviation for million.

Table 1

	Reinstatement Cost ($m)
Layer 5	5
Layer 4	8
Layer 3	10
Layer 2	10
Layer 1	20

Gross losses

The table below shows the expected whole-of-portfolio single event loss for each component of the ICRC.

Table 2

Gross losses	Amount ($m)
0.5% natural perils gross whole-of-portfolio loss	900
10% natural perils gross whole-of-portfolio loss (H3)	240
16.7% natural perils gross whole-of-portfolio loss (H4)	140
0.5% other accumulation gross loss	600

PL offset

In addition, the Appointed Actuary has determined the PL offset:

- For householders class of business, the net premiums liability central estimate, as at 31 December was $70m. The Appointed Actuary has determined the amount relating to catastrophic losses in the householders net premiums liability central estimate to be $20m. As an insurer with steady rate of growth and no seasonality of risk, the Appointed Actuary has determined the appropriate annualisation is to double this amount to $40m. The diversified risk margin for the householders class of business is 8% and net premiums liability risk charge for householders is 13.5%. The PL offset for householders is determined as $40m * (1.08) * (1.135), or $49m.
- Undertaking a similar process as for householders class of business for all other relevant classes, the total PL offset is $58m.

PL adjustment for OA VR

The Appointed Actuary has reviewed the premiums liability of the insurer and estimated the losses within the chosen OA VR scenario that have already been specifically allowed for in the net premiums liability as $40m.

Scenario 1

Natural perils vertical requirements

Components	($m)
NP PML	900
Less: potential catastrophe reinsurance recoverables	(880)
NP PML less potential reinsurance recoverables	20
Net whole-of-portfolio loss	20
Less: NP reinstatement premiums	(0)
Add: NP reinstatement costs	0
Less: ~~other~~ NP VR adjustments ~~to NP VR~~based on the Appointed Actuary's advice	(0)
Less: NP VR adjustments as approved by APRA	(0)
NP VR	20

Natural perils horizontal requirements

H3 requirements

- The events are protected by the catastrophe reinsurance program shown in Figure 1. This program has a retention of $20m for each event with the rest of the event being covered by the reinsurance, which results in the H3 net loss of $20m.

- After the first event, all of Layers 1 and 2 of the catastrophe reinsurance program are exhausted and the insurer makes a partial claim ($80m) on Layer 3. There are no reinstatement costs as there is a pre-paid reinstatement of Layers 1 and 2 and Layer 3 still has capacity ($160m).

- After the second event, the pre-paid reinstatements of Layers 1 and 2 are also exhausted and the insurer makes another partial claim on Layer 3. There are reinstatement costs for Layer 1 and Layer 2, totalling $20m and $10m. There remains sufficient capacity in Layer 3 (i.e. $80m) and so no reinstatement of this layer is necessary.

- The insurer does not have to consider reinstatements after the third event.

Components	Loss 1	Loss 2	Loss 3	Total
H3 loss	240	240	240	720
Less: H3 reinsurance recoverables	(220)	(220)	(220)	(660)
H3 loss net of reinsurance recoverables	20	20	20	60
Net H3 loss	20	20	20	60
Less: H3 ~~aggregate~~ adjustments based on the Appointed Actuary's advice~~offset~~	(0)	(0)	(0)	(0)
Less: H3 adjustments as approved by APRA	(0)	(0)	(0)	(0)
Less: H3 reinstatement premiums	(0)	(0)	(0)	(0)
Add: H3 reinstatement cost	0	30	N/A	30
H3 requirement	20	50	20	90

H4 requirements

- After the first event, all of Layer 1 is exhausted and the insurer makes a partial claim ($60m) on Layer 2. There is no reinstatement cost as there is a pre-paid reinstatement of Layer 1 and Layer 2 still has capacity ($20m in first layer, $80m in the pre-paid reinstatement).

- After the second event, the pre-paid reinstatement of Layer 1 is exhausted and the insurer makes another partial claim ($60m) on Layer 2, including part of the pre-paid reinstatement ($40m). There are reinstatement costs for Layer 1 of $20m. Layer 2 now has only $40m of capacity and therefore a reinstatement of $~~20m~~40m, or one ~~quarter~~ half of the layer is needed.[12] The cost is $~~2.~~5m. The total reinstatement cost is $~~22.5~~25m.

Components	Loss1	Loss 2	Loss 3	Loss 4	Total
H4 loss	140	140	140	140	560
Less: H4 reinsurance recoverables	(120)	(120)	(120)	(120)	(480)
H4 loss net of reinsurance recoverables	20	20	20	20	80
Net H4 loss	20	20	20	20	80
Less: H4 ~~aggregate offset~~adjustments based on the Appointed Actuary's advice	(0)	(0)	(0)	(0)	(0)
Less: H4 adjustments as approved by APRA	(0)	(0)	(0)	(0)	(0)
Less: H4 reinstatement premiums	(0)	(0)	(0)	(0)	(0)
Add: H4 reinstatement cost	0	~~22.5~~25	27.5	N/A	~~50~~52.5
H4 requirement	20	~~42.5~~45	47.5	20	132.5~~0~~

NP HR

Components	$m
Greater of H3 and H4 requirements	132.5~~0~~
Less: PL offset	58
NP HR	74.5~~2~~

Other accumulation vertical requirement

- The chosen other accumulations scenario generates an estimated gross loss of $600m.

- Reinsurance recoverables that could be claimed from the occurrence of the scenario has been estimated at $520m.

- There is no reinstatement cost at the start of the treaty year.

Components	$m
OA PML	600
Less: PL adjustment	(40)
Adjusted OA PML	560
Less: OA reinsurance recoverables	(520)
Add: OA reinstatement cost	0
OA VR	40

[12] GPS 116 requires an insurer to only include the cost of reinstating after each event, including up to the size of the fourth event (see paragraph 42 of GPS 116). This means that the size of reinstatement (and therefore cost) in the ICRC may be less than what the insurer is contractually agreed to pay to the reinsurer. APRA expects the insurer to consider these additional costs as part of its ICAAP.

Scenario 1 outcome

The greatest component of the ICRC is NP HR and produces an ICRC of $74.52m.

Scenario 2

For this scenario, there is a~~n~~ catastrophe aggregate reinsurance program which provides protection against accumulations of losses in place and the insurer has ~~agreed with APRA the methodology~~received advice from the Appointed Actuary for allowing ~~aggregate~~ Group B reinsurance recoverables for NP HR.

Catastrophe A~~a~~aggregate reinsurance program

- The program ~~inures to the main catastrophe program and~~ provides reinsurance cover of $50m in the aggregate excess of~~xs~~ $40m in the aggregate ~~on all~~ for natural perils claims that exceed $5m and are capped at ~~. The per event limit is~~ $20m.

- The insurer has estimated catastrophe attritional claims that will occur over the year that are not included in the PL offset but nonetheless contribute towards the aggregate retention will be $15m. This means the remaining aggregate reinsurance retention for the purposes of NP HR is ~~reduced to~~ $~~3~~25m. Therefore, once cumulative losses reach $2~~3~~5m in the horizontal requirement, the insurer can claim up until the limit of the program (i.e., $50m).

Natural perils vertical requirement

- As the net retention on the event is less than the aggregate reinsurance attachment point, the NP VR does not change in this scenario and remains $20m.

Natural perils horizontal requirement

H3 requirements

- The cost of catastrophe reinsurance reinstatements remains the same as Scenario 1.

- The H3 requirement is reduced by the available aggregate reinsurance cover. ~~After~~ For the second loss in the scenario, the attachment point of the aggregate reinsurance cover has been reached and the insurer can start claiming recoveries from aggregate reinsurance cover.

- For loss 2 in the H3 scenario, the insurer will have accumulated $40m in retained losses. The insurer can potentially claim $15m in aggregate reinsurance recoveries as the aggregate reinsurance cover retention is reduced to $~~35m~~ 25m for the $15m of attritional losses allowed for in outstanding claims liabilities and premiums liability that could be claimed under the aggregate reinsurance cover.

- The full amount of the retained loss could be claimed on the aggregate reinsurance cover under loss 3.

Components	Loss 1	Loss 2	Loss 3	Total
H3 loss	240	240	240	720
Less: H3 reinsurance recoverables	(220)	(220)	(220)	(660)

H3 loss net of reinsurance recoverables	20	20	20	60
Net H3 loss	20	20	20	60
Less: H3 ~~aggregate offset~~adjustments based on the Appointed Actuary's advice	(0)	(15)	(20)	(3525)
Less: H3 adjustments as approved by APRA	(0)	(0)	(0)	(0)
Less: H3 reinstatement premiums	(0)	(0)	(0)	(0)
Add: H3 reinstatement cost	0	30	N/A	30
H3 requirement	20	~~45~~35	0	~~65~~55

H4 requirements

- The cost of catastrophe reinsurance reinstatements remains the same as in Scenario 1.
- H4 reacts in a similar manner as H3 to the aggregate reinsurance cover.
- The full amount of the net loss could be claimed on the aggregate reinsurance cover under loss 3 and $15m (the remaining amount under the aggregate cover) can be claimed under loss 4 ~~and loss 4~~.

Components	Loss1	Loss 2	Loss 3	Loss 4	Total
H4 loss	140	140	140	140	560
Less: H4 reinsurance recoverables	(120)	(120)	(120)	(120)	(480)
H4 loss net of reinsurance recoverables	20	20	20	20	80
Net H4 loss	20	20	20	20	80
Less: H4 ~~aggregate offset~~adjustments based on the Appointed Actuary's advice	(0)	(15)	(20)	(~~20~~15)	(~~50~~45)
Less: H4 adjustments as approved by APRA	(0)	(0)	(0)	(0)	(0)
Less: H4 reinstatement premiums	(0)	(0)	(0)	(0)	(0)
Add: H4 reinstatement cost	0	~~22.5~~25	27.5	N/A	5~~2.5~~0
H4 requirement	20	~~37.5~~30	27.5	~~0~~5	~~85~~82.5

NP HR

Components	$m
Greater of H3 and H4 requirements	~~85~~82.5
Less: PL offset	58
NP HR	24.5~~7~~

Other accumulations vertical requirement

- The OA VR does not change in this scenario and remains $40m.

Scenario 2 outcome

The maximum component of the ICRC is now OA VR and produces an ICRC of $40m.

Scenario 3

For this scenario, assume that it is now 20 April and a natural perils catastrophe event with a gross loss of $400m has occurred, requiring the recalculation of NP VR. The insurer does not place any further reinsurance to protect the portfolio. The catastrophe aggregate reinsurance program from Scenario 2 is in place and up until 20 April the catastrophe attritional losses that erode the aggregate reinsurance retention have been $15m.

Natural perils vertical requirement

- NP VR is re-calculated after the event and a reinstatement cost for the next event is incurred.
- The estimated reinstatement cost is based on a full reinstatement of layers 1, 2 and 3 of the catastrophe reinsurance program ($20m + $10m + $10m).
- Assuming the insurer has a methodology for the inclusion of reinsurance recoverables from ~~aggregate reinsurance~~Group B reinsurance cover in NP VR (‘~~other adjustments to NP VR~~’NP VR adjustments based on the Appointed Actuary’s advice’), the insurer would be able to recognise $15m in reinsurance recoverables from the aggregate reinsurance cover. This is because the insurer’s cumulative net retained losses at 20 April is the $15m of catastrophe attritional losses, the $20m retention from the 20 April event and $20m retention from the event that generates NP VR. This totals $~~45m~~ 55m which fully erodes the $40m aggregate retention and therefore the insurer can include $15m as an adjustment to NP VR.

Components	$m
NP PML	900
Less: potential catastrophe reinsurance recoverables	(880)
NP PML less potential reinsurance recoverables	20
Net whole of portfolio loss	20
Less: NP reinstatement premiums	(0)
Add: NP reinstatement costs	40
Less: ~~other adjustments to NP VR~~NP VR adjustments based on the Appointed Actuary’s advice	(15)
Less: NP VR adjustments as approved by APRA	(0)
NP VR	~~45~~5

Natural perils horizontal requirement

- NP HR remains constant over the catastrophe treaty year and therefore remains $27m.

Other accumulations vertical requirement

- The OA VR does not change in this scenario and remains $40m.

Scenario 3 outcome

The maximum component of the ICRC is now NP VR and produces an ICRC of $~~55m~~45m.

Attachment 2 – Whole-of-portfolio calculation methods

Paragraph 24 of this PPG sets out four potential methods to calculate the whole-of-portfolio outcome for an insurer. This Attachment sets out further details on these methods.

Simulation/dynamic financial analysis

Simulation or dynamic financial analysis methods can be used by an insurer to estimate the gross or net loss at a given exceedance probability. Simulation allows an insurer to run a large number of loss scenarios, over a given year, incorporating all natural perils across all geographic regions based on model output from potentially different model vendors. The results of the simulation model can be summarised to produce loss distributions for the entire portfolio, which allows the insurer to determine the single event loss at a certain exceedance probability.

When the various loss scenarios are summarised into a loss distribution without allowing for reinsurance, the resulting loss distribution represents gross losses, which in turn yield a Probable Maximum Loss (PML) from which the impact of reinsurance can subsequently be evaluated and deducted. This method is particularly effective when reinsurance arrangements are free from basis risk.

Alternatively, if each loss scenario is first adjusted to reflect the specific reinsurance response to that scenario before developing the loss distributions, the resulting figures will represent net losses—thus providing net loss distributions and a net PML.

As with other simulation-based methods, the insurer is expected to be aware of the potential for simulation error to introduce additional uncertainty into the results.

Aggregation of single peril loss exceedance curves

Where an insurer can estimate loss exceedance curves for two or more perils, it can approximate the whole-of-portfolio loss by adding the relevant loss probabilities from the loss exceedance curves.

An insurer's catastrophe modelling output typically provides the insurer with loss exceedance curves for single perils. Where separate modelling is performed for different perils and/or different geographic regions, the separate catastrophe model outputs could be combined analytically. It should be noted this analytical approach assumes independence between risks.

As an example, an insurer may have a portfolio that contains only three major perils, i.e. Sydney earthquake, Melbourne earthquake and Brisbane windstorm. In determining the loss distributions for these perils in each region, the probability of a single event loss for each peril exceeding $1 billion is 0.2 per cent, 0.2 per cent and 0.1 per cent respectively. Aggregating these probabilities gives a 0.5 per cent probability of a single event loss exceeding $1 billion for the insurer. The whole-of-portfolio loss is not likely to be materially different from $1 billion.

This approximation method is more appropriate for losses at higher return periods (i.e. for events that occur with low frequency) due to the mathematical out-workings of this method. See Attachment A of APRA's September 2010 ICRC technical paper[13] for further details. Therefore, APRA envisages it could be used for calculating NP VR. It is imprudent for an insurer to rely on this method at lower return periods without adjustment, as the error in the outcome would be more significant.

Aggregation of single peril losses

Where an insurer is not able to reasonably estimate loss exceedance curves for different risks, but can nonetheless estimate the losses at the relevant exceedance probability for each risk then, assuming independence between risks, it may aggregate these estimates using the 'square root of sum-of-squares' formula:

$$PML_T = \sqrt{\sum_{i=1}^{n} PML_i^{\,2}}$$

For natural perils (particularly those with heavy-tailed loss distributions such as earthquake) the loss is likely to be underestimated, as such the following formula may be more appropriate:

$$PML_T = \left[\sum_{i=1}^{n} PML_i^{\,k}\right]^{1/k};$$

where k is a suitably chosen factor reflecting the fat-tailedness of the risks, and 1 < k < 2. For simplicity, the square root sum-of-squares formula would normally be acceptable.

Blending approach

At lower return periods, there may be relevant historical loss data at the industry and/or the insurer level to estimate potential losses. Where relevant data is available and credible, APRA expects the insurer to consider both historical experience data and catastrophe model output in their assessment of catastrophe risk.

The historical loss data could be used in a number of ways. For example, it could be used to test the adequacy of catastrophe model outputs, or used to model losses for other perils which have not been adequately captured by the commercial catastrophe models, or to model smaller catastrophe losses which would blend in with the catastrophe model output at lower return periods.

Following a catastrophic loss, it is good practice for an insurer to compare actual experience against modelled losses and to seek to understand the differences. The analysis can enhance understanding of the areas of 'model miss' and potential issues with exposure data quality or modelling assumptions. Where appropriate and material, the insurer is expected to consider adjustments to catastrophe model output in light of historical experience to reflect limitations in either the model and/or the exposure data inputs.

When using historical loss data to model losses for non-modelled perils or smaller catastrophe losses, the insurer is expected to consider the credibility and reliability of the data, apply appropriate adjustments and scaling to the loss data for growth, inflation and changes in exposure, and understand the impact of potential gaps and skews in the historical record. Where there is blending between a historical experience model and a commercial catastrophe model, the credibility weighting of the experience model is expected to decrease as the return period increases.

[13] https://www.apra.gov.au/sites/default/files/Insurance-Conc-Risk-charge%5B1%5D.pdf

Attachment 3 – Reinsurance adjustments in accordance with GPS 115 and GPS 116

GPS 115 and GPS 116 include circumstances where the insurer must seek advice from the Appointed Actuary to determine the appropriate adjustments for reinsurance arrangements. This section provides guidance related to these requirements.

GPS 115 Capital Adequacy: Insurance Risk Charge

Categories of Reinsurance

GPS 115 requires the Appointed Actuary to advise an insurer how to adjust the Insurance Risk Charge if applying the capital factors as described in paragraphs 12 (for Outstanding Claims Risk) or 17 (for Premiums Liability Risk) would result in a material and ongoing under- or over-statement of the Insurance Risk Charge, unless the adjustment must be approved by APRA as set out in paragraphs 14 and 19 respectively.

The table below provides principles and examples for the capital treatment of different types of reinsurance under GPS 115, including where an adjustment can be advised by the Appointed Actuary or must be approved by APRA. For clarity, in this context, adjustments based on the Actuary's advice or as approved by APRA refer to adjustments made after the application of reinsurance.

Who can determine the capital adjustment related to reinsurance	Principle and Examples
Insurer applies the capital treatment prescribed in the standards without referral to either the Appointed Actuary or APRA	The insurer assesses the Insurance Risk Capital Charge using the standard approach of applying a capital factor percentage to the Net Central Estimate. The insurer is unable to adjust the Insurance Risk Capital Charge from this amount. APRA anticipates that for most reinsurance arrangements no adjustment is needed.
Insurer must seek advice from the Appointed Actuary before determining capital treatment	This applies to reinsurance where: • applying the standard approach would result in persistent and material under- or over-statement of the Insurance Risk Charge. *e.g. Adverse Development Cover; or* • the insurer would normally require APRA approval to determine the appropriate capital treatment, as below, but the Appointed Actuary has assessed the arrangement and impact on capital is not material.

APRA must approve the insurer's proposed capital treatment	This applies to reinsurance where: • the adjustment under GPS 115 impacts the capital assessment under GPS 116, including where an adjustment under GPS 115 impacts the ICRC calculation or amount (for example, due to a change in the available reinsurance or change in the remaining deductible or limit), or where an adjustment is also required under GPS 116 • *e.g. An arrangement such as a stop-loss which requires an adjustment to the premium liability risk charge, and this adjustment impacts the reinsurance recoveries in the ICRC*; or • the Appointed Actuary advises the insurer to make such a referral.

An example of where an adjustment may be required and the insurer must seek advice from the Appointed Actuary for determining the capital treatment is an Adverse Development Cover. A suggested framework for considering the adjustment related to an Adverse Development Cover is included in an example below.

An example of where an adjustment may be required and APRA must approve the insurer's methodology is a stop-loss reinsurance cover that provides protection against both attritional and catastrophic losses. As the remaining deductible or limit depends on attritional losses, an adjustment to capital required allowing for the stop-loss under GPS 115 may also impact the available reinsurance to offset capital under GPS 116. As the adjustment to GPS 115 would impact the assessment of capital under GPS 116 it must be referred to APRA in accordance with paragraph 14(a) or 19(a). An example of this form of cover is included below.

Adjustments based on the Appointed Actuary's advice

The Appointed Actuary's advice must include a methodology that the insurer can apply over the life of the relevant reinsurance arrangement. Once an adjustment is made, the methodology must be maintained until the expiry of the arrangement unless otherwise agreed with APRA except in the following cases:

- if the arrangement would normally need to be referred to APRA but has been assessed as immaterial, the materiality assessment has not changed, and the Actuary determines a different adjustment methodology is more suitable then the change in methodology must be documented in the ReAS; or
- if the arrangement would normally need to be referred to APRA but had been assessed as immaterial, and the arrangement later becomes material, the Appointed Actuary must advise the insurer of this assessment and that the insurer must obtain APRA approval for the capital treatment.

If the insurer does not accept the advice of the Appointed Actuary, the adjustment methodology must be approved by APRA before it is recognised.

Other Considerations

If the adjustment relates to a reinsurance arrangement that is not provided by a reinsurer, the Appointed Actuary should consider whether the arrangement provides suitable protection for the insurer. This should include, but not be limited to, consideration of whether the investment profile of assets backing the arrangement introduces a material risk impacting the ability of the insurer to make recoveries from the reinsurance arrangement. If the Appointed Actuary views that there are material risks which are not adequately protected by capital the Appointed Actuary should notify APRA.

Example where insurer must seek advice from the Appointed Actuary (Adverse Development Cover)

The Appointed Actuary must advise the insurer how to adjust the Insurance Risk Charge, where applying the Insurance Risk Charge factors to the net central estimate will produce a material and ongoing over- or under-statement of the Insurance Risk Charge.

An example of when this may occur is for non-proportional reinsurance such as an Adverse Development Cover (ADC). For such a cover, the insurance risk charge may be either under- or over-stated depending on where the reinsurance attaches.

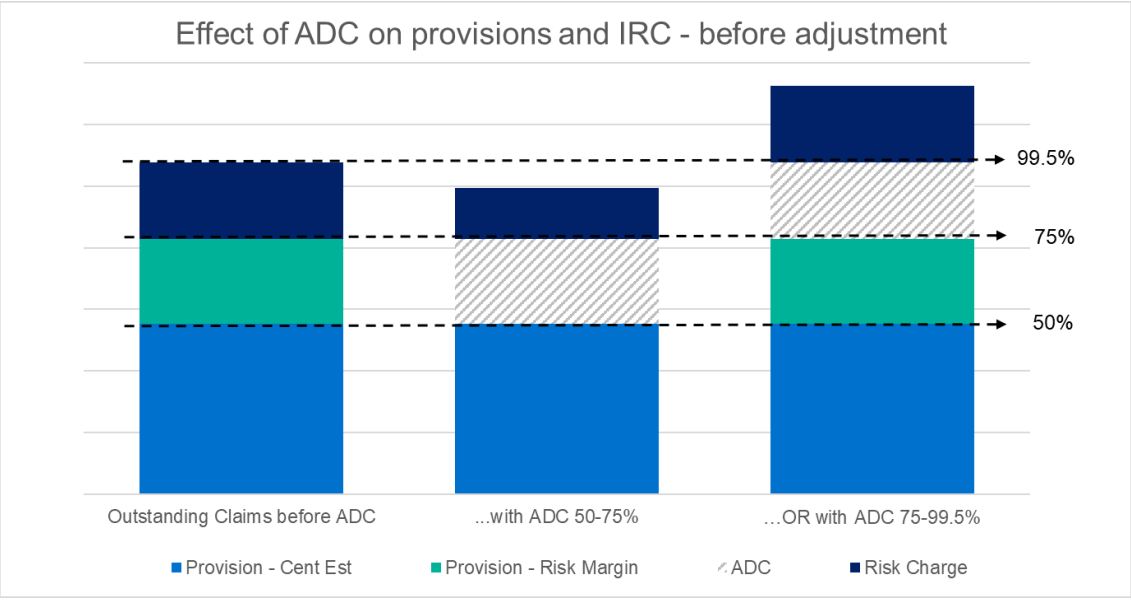

Figure 1: Application of GPS 115 without adjustment. Applying a capital factor to the outstanding claims provision results in differing levels of overall protection due to either an under-statement or over-statement of capital, depending on where the ADC attaches. We assume that the Appointed Actuary will already adjust the risk margin for the protection provided by the ADC.

This example, as shown in Figure 1, considers two cases:

An ADC that covers from the 50th to 75th percentiles only would likely see the Appointed Actuary remove the risk margin, appropriately reducing the provision. Applying a fixed capital factor to the reduced provision leads to a

reduced insurance risk charge despite the ADC providing no protection in the range covered by the risk charge. This is shown in the middle column of Figure 1 above.

An ADC that instead protects from the 75th to 99.5th percentile outcomes would have no effect on the insurance liability provisions which in turn would lead to no change in the calculated risk charge. Therefore, the risk charge and ADC are both protecting against adverse outcomes leading to a much higher level of security than APRA requires. This outcome is shown in the right-hand column of Figure 1.

Both of these outcomes are inappropriate because the Insurance Risk Charge is either inadequate or excessive relative to the risk being covered, as shown in Figure 1.

The high level principle for adjusting for an ADC is to ensure that all possible outcomes up to the 99.5th percentile remain protected by either provisions, capital or ADC reinsurance. That means adjusting the IRC to accommodate for the actions of the ADC, as shown in Figure 2.

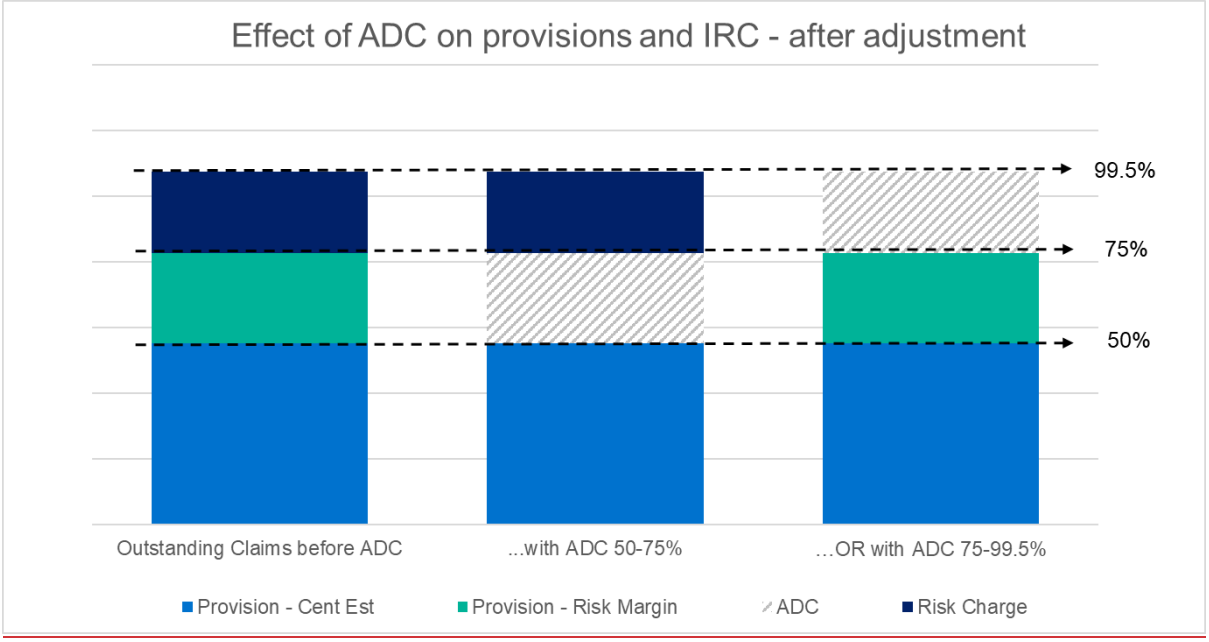

Figure 2: After allowing for an adjustment to standard capital treatment. This method ensures the level of overall protection (made up of a combination of provisions, capital and reinsurance) is at the same level in all cases

This is achieved by first assessing the outcome at the 99.5th percentile without the ADC, calculated by adding the central estimate plus risk margin plus IRC capital as required by the prudential framework as if the ADC were not in place. The ADC can then be introduced; to the extent the ADC protects some of the 99.5th percentile outcomes, there is no need to hold provisions or capital (as appropriate) to cover that same range. This aims to ensure that the original 99.5th percentile outcome is fully covered by a combination of net provisions, ADC and IRC capital without over-estimating (double-counting) or under-estimating (reducing) due to the form of protection or method used for calculation.

This effect will generally vary over time. Assuming an ADC with an attachment point above the central estimate and assuming the portfolio does not perform worse than expected, as claims are paid and outstanding claims

provisions reduce, the attachment point for the ADC becomes more remote, and the overlap moves further into the IRC capital region rather than the risk margin, similar to the right-hand column in Figure 2. This results in the IRC capital being overstated relative to the risks of the portfolio, assuming the ADC cover does not move beyond the 99.5% requirement of the insurance capital framework altogether.

More generally, the Appointed Actuary should consider the total level of protection related to the insurance liability outcomes when making an adjustment. Total protection includes insurance provisions including risk margin, risk charge and reinsurance recoverables.

Insurers may have reinsurance with similar effects to that shown in this example but any effects may be temporary or immaterial. For example, an under- or over-estimation of the IRC caused by a Catastrophe Excess-of-Loss cover may be temporary and resolved over a limited period as catastrophe claims are paid out. In these cases, an adjustment is not required.

Example where APRA must approve capital treatment (Stop-loss Cover)

The insurer must obtain APRA approval for a methodology to recognise reinsurance arrangements where an adjustment under GPS 115 impacts the capital assessment under GPS 116.

An example of when this may occur is for a stop-loss which covers all losses for a particular accident year once a certain threshold is reached, say, relative to an expected loss ratio of 70% based on expected net premium. For simplicity we will ignore other accident years. The example is shown in Figure 3.

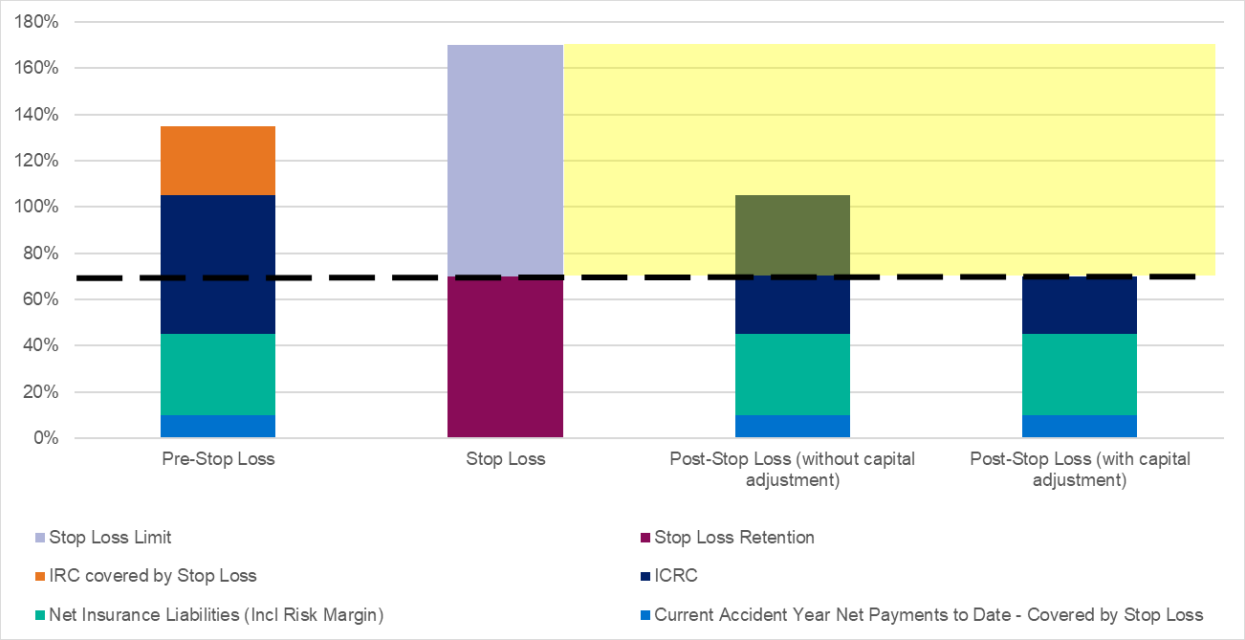

Figure 3: A stop-loss arrangement which provides protection against attritional and catastrophic losses. The stop-loss provides protection which can offset provisions and capital required under both GPS 115 and GPS 116.

Such a cover would impact both GPS 115 and GPS 116:

- the insurance liability (central estimate plus risk margin) is intended to cover claims outcomes to the 75th percentile. To the extent that the stop-loss provides protection against these outcomes, the Appointed Actuary can adjust the central estimate and risk margin as appropriate;

- the Insurance Risk Charge defined in GPS 115 is intended to protect against claim outcomes between the 75th and 99.5th percentile. The risk charge would erode the stop-loss retention, and/or be unnecessary if the stop-loss operates in this range and there is an overlap between the capital and reinsurance protection; and

- the ICRC is intended to protect against the net financial impact from either a single large event or a series of smaller events, within a one-year return period up to the 99.5th percentile. This stop-loss arrangement would potentially provide protection against various components of the ICRC to the extent that claims incurred in the accident year exceed the attachment point of the stop-loss cover, and be covered up to the loss ratio limit (which is set above the 99.5th percentile).

These adjustments would need to be approved by APRA as an adjustment to GPS 115 to correctly allow for a reduction in the Premiums Liability risk charge would impact the remaining deductible and limit for the calculation of the ICRC scenarios, and hence the assessment of capital under GPS 116 which would also need APRA approval.

The high level principle for considering such a cover would be similar to the Adverse Development Cover example above: either reinsurance or capital can provide protection against the relevant outcomes and the risk should not be either over-estimated (double-counted) or under-estimated (reduced) due to the method used for calculation.

A suitable methodology for calculating the adjustments to the IRC and ICRC will depend on the specifics of the reinsurance arrangement. For the arrangement described above a methodology would need to consider:

- the expected remaining retention to reach the stop-loss attachment point. This "gap" to erode the retention for covered claims in an accident year only needs to be allowed for once – an adjustment methodology would need to consider where the erosion of this retention may be double-counted between the provisions, IRC and ICRC;

- the "gap" to the stop-loss attachment point will depend on payments made to date and the unpaid portion of projected ultimate losses for the accident year on covered claims. The Appointed Actuary should consider the purpose and accuracy of budgeted loss ratios and forecast net premiums to ensure they are suitable for the purposes of making an adjustment impacting capital requirements. The Appointed Actuary should also consider the implications of premium volumes differing ~~to~~from expectations;

- the NP HR must be calculated at the reporting date on or prior to the inception date of the reinsurer's catastrophe program and held constant for the remaining duration of the program. This calculation will need to allow for expected reinsurance recoveries based on expected / planned loss ratios and expected premium revenue;

- the NP VR and OA VR are to be calculated at each reporting date and should allow for expected reinsurance recoveries based on the latest projection of premium revenue and net ultimate claims covered by the stop-loss; and

- the IRC would need to be calculated *after* the ICRC and allow for expected reinsurance recoveries from the stop-loss, with consideration for the ICRC's impact on eroding the "gap" to the stop-loss attachment or level of expected reinsurance recoveries from the stop-loss.

GPS 116 Capital Adequacy: Insurance Concentration Risk Charge

Categories of reinsurance

GPS 116 requires an insurer to seek advice from its Appointed Actuary to recognise potential reinsurance recoverables from Group B reinsurance in the NP VR or NP HR. The Appointed Actuary may advise the insurer to seek approval from APRA for an adjustment for any reason, including where the Appointed Actuary is not able to determine a suitable adjustment.

APRA must approve the methodology for the determination of any adjustment related to Group C reinsurance.

For clarity, in this context, adjustments based on the Actuary's advice or as approved by APRA refer to adjustments made after the application of reinsurance.

A summary of the different categories of reinsurance as defined in GPS 116 and the assessment principles and examples are described in the table below:

Category of Reinsurance Capital Assessment	Principle and Examples
Insurer can determine capital treatment without referring to either the Appointed Actuary or APRA	This category includes Group A reinsurance: Traditional all-perils, all-region covers without any optionality or contingent features. *E.g. traditional quota-share or catastrophe excess-of-loss reinsurance.*
Insurer must seek advice from Appointed Actuary before determining capital treatment	This category includes Group B reinsurance: • any arrangements that do not fall in Group A or Group C; or • arrangements that meet the Group C criteria that are not sufficiently material to refer to APRA. This category would include arrangements with optionality or contingent features. *E.g. a 'Top and Drop' cover that can respond to either a large single event or a series of retained losses from multiple smaller events, depending on which occurs first.* This category would include arrangements with basis risk that is limited to peril coverage and/or geographic region. For a Level 2 insurance group, this category also includes reinsurance which has basis risk due to varying levels of reinsurance coverage across legal entities within the group. *E.g. a single-peril cat bond covering a specific region with an indemnity-based trigger.*

APRA must approve the insurer's proposed capital treatment	This category includes Group C reinsurance: • where the arrangement introduces basis risk between the losses and the reinsurance recoveries except for basis risk in terms of peril coverage and/or geographic region. For a Level 2 insurance group, this includes basis risk arising from varying levels of reinsurance coverage across legal entities within the group. *E.g. arrangements with parametric triggers, Industry Loss Warranty*; • if the adjustment under GPS 116 would impact the capital assessment under GPS 115, including where an adjustment under GPS 116 impacts the IRC calculation or amount (for example, due to a change in the available reinsurance, or a change in the remaining deductible or limit) or where an adjustment is also required under GPS 115. *E.g. a stop-loss or aggregate reinsurance cover which protects against both attritional losses and catastrophic events, where the remaining deductible or limit assumed in the ICRC will depend on the amount of attritional losses and recoveries allowed for under the Premiums Liability risk charge. In this case, as an adjustment is being made under GPS 115 which impacts the amount of reinsurance recoveries included in GPS 116 to determine the ICRC capital amount, this will be a Group C reinsurance arrangement. For more details refer to the stop-loss example in the GPS 115 section of this attachment*; or • where the Appointed Actuary advises the insurer to make such a referral.

Adjustments based on the Appointed Actuary's advice

The Appointed Actuary's advice must include a methodology that the insurer can apply over the life of the relevant reinsurance arrangement. Once an adjustment is made, the methodology must be maintained until the expiry of the arrangement unless otherwise agreed with APRA except where:

- the arrangement would have been classified as Group C reinsurance but was assessed as not being material, and then later becomes material, in which case the methodology must be approved by APRA;
- the arrangement remains Group B reinsurance and the Appointed Actuary determines that a different adjustment methodology is more appropriate, in which case the change in methodology, and the rationale for the change, must be documented in the ReAS; or

- the change in methodology is approved by APRA.

If the insurer does not to accept the advice of the Appointed Actuary, the adjustment methodology must be approved by APRA before it is recognised.

Basis Risk

Basis risk is defined in GPS 116 and refers to the risk that there is an imperfect correlation between the underlying losses of the insurer and the recoveries under the reinsurance contract. This is not intended to capture features where, after being defined in the contract, the absolute size of the loss is the only variable which will impact reinsurance recoverables (examples of which include deductibles, limits or quota share cession ratios). This is also not intended to capture reinsurance programs with varying levels of reinsurance coverage across a portfolio. Examples of basis risk would include, but not be limited to, arrangements where the reinsurance contract:

- -does not cover all perils;
- does not cover all regions;
- uses a non-indemnity-based trigger (e.g. a cover where the payout is based on an index, a parametric trigger, or industry wide losses); or
- has other payout conditions that may impact recoverability under the contract.

Reinsurance arrangements that include basis risk which is limited to not covering all perils and all regions are not prevented from being considered in Group B as a result of that basis risk. An example of an arrangement that would fall into this category would be a catastrophe bond that specifically protects against a Sydney earthquake and provides cover on an indemnity basis. For a Level 2 insurance group, this category also includes reinsurance which creates basis risk due to varying levels of reinsurance coverage across legal entities within a group.

For reinsurance where basis risk exists and it is not limited to not covering all perils and all regions, the arrangement is likely to be Group C reinsurance. Examples of reinsurance that would fall into this category are arrangements that are not indemnity based, such as a catastrophe bond with a parametric trigger or an Industry Loss Warranty. APRA must approve a calculation methodology for these arrangements before they are recognised in the ICRC calculation.

In accordance with GPS 116 paragraphs 21, 35 and 46, an insurer with reinsurance arrangements that have basis risk must use the net whole-of-portfolio method to calculate the NP VR and NP HR requirements.

Other considerations

If the adjustment relates to a reinsurance arrangement that is not provided by a reinsurer, the Appointed Actuary should consider whether the arrangement provides suitable protection for the insurer. This should include, but not be limited to, consideration of whether the investment profile of assets backing the arrangement introduces a material risk impacting the ability of the insurer to make recoveries from the reinsurance arrangement. If the Appointed Actuary views that there are material risks which are not adequately protected by capital the Appointed Actuary should notify APRA.