Actuaries Institute.

Technical Paper: Framework for Setting Life Insurance Best Estimate Assumptions December 2024

Contents

1. Introduction

1.1. Status of Technical Paper

This Technical paper (TP) was prepared by the Life Insurance Practice Committee (LIPC) of the Actuaries Institute. It does not represent a Professional Standard or Practice Guideline of the Actuaries Institute.

This is the second version of this TP.

1.2. Objective

The objective of this TP is to provide life insurance practitioners with a resource that outlines common considerations for assumption setting. This is intended to be an aid to actuaries when undertaking their work. Links to other resources are also provided.

Whilst this TP outlines matters for consideration when determining assumptions for different purposes and in different contexts, the need to apply actuarial judgment in all situations continues to apply.

1.3. Scope

The scope of this TP is best estimate assumptions used for actuarial modelling of life insurance business. This note gives greater focus to material[1] assumptions where there is a regular, comprehensive experience investigation such as annual financial reporting.

Best estimate assumptions should be determined based on the context and purpose of the investigation in question considering the relevant guidance and regulations as outlined in section 3.

2. Framework

Actuarial investigations are an important part of the Actuarial Control Cycle for life insurance business. These investigations provide feedback on actual experience compared to the expected experience and enable both the updating of assumptions and for strategic advice to be provided to the business if action is required. In some cases, they are also a regulatory requirement.

Assumptions about future experience are required for projections of business for various purposes such as financial reporting, regulatory capital and pricing. The outcomes of experience investigations can guide the setting of assumptions about future experience.

[1] **Material** – Relevant to a decision of an Intended User of the Services as defined in the Actuaries Institute's 'Glossary of Defined Terms Used in Practice Guidelines'. For this purpose, "Material" does not have the same meaning as in Australian accounting standards. "Materially" has a meaning consistent with "Material".

Moreover, assumption setting exercises and their associated business analytics can enrich the advice that actuaries give to companies regarding strategic and product decisions. This can be a factor in decisions around granularity of assumption reviews, as opposed to the actuary's needs for regulatory or financial reporting requirements.

When utilising the framework outlined in this TP, consideration can be given to the intent and purpose of the assumption setting process. Approaches to assumption setting may differ depending on the purpose, for example, financial reporting, capital purposes, product development or pricing, etc. In addition, the factors considered in assumption setting may differ for financial reporting depending on the nature of the business. In particular, the concept of contract boundaries may be a consideration in determining the time horizon of what assumptions to review and experience factors to consider.

The key stages of the process and the structure of this TP are as follows:

- Considering existing guidance and regulations - section 3;
- Planning the timing and frequency of each investigation - section 4;
- Identifying and collecting data and such that it is fit for purpose - section 5;
- Analysing past experience and emerging trends - section 6;
- Considering future drivers and converting analysis to assumption sets – section 7;
- Having proposed assumptions reviewed – section 8; and,
- Disclosing the assumption review for internal and external stakeholders – section 9.

3. Guidance and regulations

This section lists references used in compiling this TP. For clarity, this TP is supplementary to these sources and not a replacement.

Links to standards, regulations and guidance referred to in this section are provided in Appendix A.

3.1. Australian Life Prudential Standards

LPS 340 (Valuation of Policy Liabilities) requires assumptions for policy liabilities to reflect a best estimate of the likely experience. They must be set having due regard for, but not limited to:

- The materiality of the benefits being considered;
- The effect of particular assumptions on the determined result;
- Reasonably available statistics and other information; and/or,

- Any options or asymmetrical distribution of liability outcomes.

The Standard states that these best-estimate assumptions about future experience must be neither deliberately overstated nor deliberately understated. Specific requirements are also set with relation to expense assumptions.

CPS 320 (Actuarial and Related Matters) also requires the Appointed Actuary to disclose in the Actuarial Valuation Report the methodology and assumptions used in the calculation of policy liabilities and regulatory capital.

3.2. Accounting standards

The Australian Accounting Standard Board (AASB) accounting standard AASB 17 (Insurance Contracts) requires the present value of life insurance liabilities to be valued using assumptions that are:

- Probability-weighted and unbiased, incorporating all reasonable and supportable information available without undue cost or effort;
- Reflective of the perspective of the entity;
- Current, reflecting conditions existing at the measurement date; and,
- Explicit, with adjustments for non-financial risk made separately from the other estimates.

3.3. Institute Standards and Guidance

The Institute's Professional Standard PS 201 (Actuarial Advice to a Life Company or Friendly Society) sets requirements for Appointed Actuaries concerning experience investigations and assumptions. For instance, the Appointed Actuary must be satisfied as to the suitability of all material assumptions about the expected future experience.

At the time of writing, the Institute has also published the following Technical Papers and Information Notes, which may be relevant to assumption setting (links to these papers can be found in Appendix A):

- Technical Paper: Discount Rates for APRA Capital Standards (2023);
- Technical Paper: The Development and Use of Volatility Assumptions (2023);
- Technical Paper: Analysing Disability Income Experience and Setting Best Estimate Assumptions (2021);
- Technical Paper: Asymmetric Risk (2021);
- Technical Paper: AASB 17 Insurance Contracts (2021);
- Technical Paper: Climate Change for Appointed Actuaries (2023);

- Technical Paper: Framework for Setting Life Insurance Risk Margins for Regulatory Capital (2016);
- Information Note: IBNR (2014);
- Practice Guideline 199.03: Economic Valuations (2011);
- Practice Guideline 4 AASB 17 Insurance Contracts (2023); and,
- Practice Guideline 6A Target Capital Life, General and Health Insurance (2022).

3.4. International and overseas standards

The International Actuarial Association has published a standard of actuarial practice (ISAP 1) which covers general actuarial practice on data, assumptions and methodology, peer review and documentation.

In the UK, the Board for Actuarial Standards has published various actuarial standards including ones for data, modelling and reporting for actuarial work falling within their scope.

4. Timing considerations

The timing and extent of assumption reviews will vary from entity to entity and depending on the purpose for which they are used and their materiality. The frequency of the assumption setting exercise may depend on the frequency of reporting, the materiality of the assumption, uncertainty in setting the assumption and the potential for the experience to develop and change rapidly. Assumptions that are less material or more certain may be reviewed less frequently, though value can be gained from periodic re-assessment of all assumptions in use.

New assumptions might be set following external factors such as a change in policy terms and conditions or launch of a new product, regulatory change, changes to distribution, external events (e.g. pandemic) and known industry impacts that may not yet be apparent in experience studies. Additionally, new assumptions may be set on an ad-hoc basis for valuing large bulk transactions such as group insurance or reinsurance quotes.

Reinsurers may also consider the frequency and reliability of data being made available to them to update their analyses.

APRA expects that life companies will set claims assumptions using the most recent industry table or industry experience study with a release date not older than 18 months at the time assumptions are set[2].

[2] As set out in APRA's letter to life companies dated 30 September 2020 regarding individual disability income insurance sustainability measures.

An annual investigation into retail lump sum and income protection claims experience is conducted under the remit of The Council of Australian Life Insurers (CALI) and the retail lump sum and income protection industry tables are updated at 5-yearly intervals. Subscription to the experience investigations and industry tables can be made available to members of CALI and upon request to non-members via cali.org.au.

It is advantageous to conduct the assumption review in a timely manner, to allow robust analysis and investigation of specific items before assumptions are implemented. This is to be balanced with the value gained from incorporating the most up to date credible experience possible. It may be possible to supplement a detailed investigation with more recent high-level analysis. It is also important to consider how well developed the experience is – a large proportion of unreported claims for the final period of the investigation, for example, means the results for that period are subject to more uncertainty, to the point where their inclusion may not assist the assumption setting process.

For the review of a major assumption, the time taken to perform the following potential stages of the assumption review may require planning:

- Collecting data and checking it is fit for purpose;
- Performing the analysis and calculations, and having them reviewed;
- Considering additional information and applying judgement to formulate draft assumptions;
- Assessing the financial impact;
- Communicating the results and insights to internal and external stakeholders;
- Obtaining general agreement and sign-off (including any rework);
- Implementing the assumptions and updating the actuarial model or other models that use the assumption; and,
- Recording and disclosing the investigation throughout this process.

A point for consideration when analysing experience and setting assumptions is their interaction with other assumptions.

For a fast-developing experience issue, there may be a desire for frequent assumption reviews which can be completed quickly using less rigorous techniques (e.g. using the analysis of profit), or targeted investigations focusing on particular aspects of the experience. These investigations may be sufficient in the circumstances and negate the need to complete a detailed investigation making use of all available data and modelling techniques. In these circumstances, the actuary could take note of any misalignments between the full investigations and the analysis of profit or any targeted investigations and make an allowance to adjust the results accordingly. For example, the analysis of profit may allow for the full claims reserves movement whereas the experience investigation may only allow for them in a simplified manner.

The downsides of doing extra full investigations in response to emerging experience issues, are that there may be insufficient new observations to statistically conclude the assumption is inappropriate, and the full investigation requires significant effort and time to complete. Qualitative evidence can be insightful on the cause and sustainability of new experience issues. Stakeholder communication at this time is very important as the feedback received can be used to validate the supporting evidence.

Consideration as to the ordering of Incurred But Not Reported (IBNR), Reported But Not Admitted (RBNA) and Claims in Course of Payment (CICP) assumption reviews is also usually undertaken. This is because RBNA and CICP assumptions will be used in determining ultimate claims and hence the IBNR assumption.

For an emerging risk with high uncertainty, consideration may need to be made to when the risk has transitioned from something that requires monitoring versus explicit consideration in the best estimate assumption setting. When an adjustment is to be made for a highly uncertain event, it may be considered through either changing best estimate assumptions or through capital by adjusting risk margins or target capital levels.

Factors that may be considered in deciding when to incorporate emerging risks into assumption setting include:

- Relevance to the lines of the business;
- Level of certainty in the risk;
- Potential financial impact;
- Expected time horizon of the risk; and,
- Information and data available to incorporate into assumption setting.

For risks that have emerged, while there may no longer be an expected future impact, consideration may need to be made as to how that risk has impacted the past experience which is being relied upon for setting the best estimate assumptions.

5. Data considerations

This section discusses some of the considerations that might be made with regards to data used as part of the assumption setting process. As with other sections of this TP, the actuary is expected to apply judgement in determining the relevance of data considerations discussed in this section given the materiality of an assumption and the purpose for which it will be used.

5.1. Data requirements

An important early step in an experience investigation is to consider what data may be available and how to source it. It may not be sufficient for the actuary's purpose to only update the prior experience investigation data.

The investigation may benefit from a fresh consideration of whether the data used is defined, reliable and relevant. The data is defined if it is not open to misinterpretation (Section 5.3). Data is reliable if that information is materially accurate (Section 5.4 and 5.5). Relevance is assessed by how insightful and useful the data will be in predicting the future level of an assumption. The applicability of past experience in setting assumptions is considered further in Section 7.

5.2. Sources of data

To the extent possible and appropriate when setting assumptions, entity specific data can be informative to the assumption being made. Particularly, in the case of demographic assumptions, the entity's assumption setting may involve calibrating the entity's own data to an externally derived base table, such as an industry standard table.

Where such data is not available, relevant, or credible, for example when pricing for a new product or benefit, the actuary could consider industry data, data from other comparable sources, population data, or other published data, adjusted as appropriate.

External data could be sourced from:

- industry publications such as CALI experience investigations;
- regulator publications such as APRA statistical bulletins;
- population demographic information (ABS and other);
- external consultants;
- Reinsurers;
- publicly available economic information from sources such as the ASX and RBA;
- economic data providers such as Bloomberg and Reuters;
- socioeconomic data providers; and/or,
- medical data sourced from private and public studies.

Australian data (where available) could be supplemented with overseas equivalents if the actuary considers the data would enrich their other data and be insightful for predicting experience.

5.3. Defining the data

It is helpful to define all items of data used to set assumptions to give clarity and avoid errors for both users and providers of data. Examples of areas where ambiguities can arise include:

- Sum insured (for example, this could be interpreted as initial sum insured or current sum insured inclusive of loyalty bonus, or gross/net of reinsurance);

- Claim payments (this could be taken to mean sum insured only, or inclusive of claim expenses, interest or premium refunds);
- Premiums (could be gross or net of stamp duty); and/or,
- Claim date (may refer to date of incidence, diagnosis, notification, decision or payment).

It can be helpful to the actuary and other users to define data consistently over time or make allowance for differences. Inconsistency can arise from changes in processes and sourcing data from multiple sources.

The expense data, often provided by a finance department, would typically be used to consider the terms of the expenses required for the actuary's reporting purpose compared to the original purpose – for example, whether they include allocations of overheads from a parent company. The setting of expense assumptions may differ depending on the purposes for which they are being set, for example, financial reporting, capital valuation, product design or pricing, etc. Examples of items to consider include:

- Removal of one-off expenses in setting maintenance expense assumptions under LPS 340;
- Allocation of fixed and variable overheads in setting directly attributable expenses under AASB 17; and
- Volumes of expected new business to which acquisition expense assumptions relate.

Care may need to be taken in understanding the definitions of any externally sourced data. This may result in adjustments to make external data comparable to internal experience. For example, external data may have been measured on a life basis, while internal assumptions are weighted by amounts.

5.4. Industry data collection

There are two industry data collection exercises:

- CALI sponsors a bi-annual collection of retail lump sum and income protection data in order to provide an annual experience investigation update and industry tables updated at 5 yearly intervals, and
- APRA requires a bi-annual collection of income protection claims data.

Additionally, in February 2024 the Actuaries Institute issued a Disability Income Data Collection Guide to assist life insurers with determining what data they could collect for their portfolio having regard to use or capacity and to inform their understanding of product sustainability.

APRA and ASIC released a consultation on life insurance data collections in December 2023 which identified a number of fields in addition to the current CALI and APRA data specifications.

It may be useful to consider what fields are required or proposed by industry data collections in considering the design of data and assumption specifications.

5.5. Validation

It is common during the review of major assumptions for data to be reviewed and checked for consistency, completeness and accuracy. An example of the type of validation checks that might be performed are listed below (re-produced from the International Actuarial Association's ISAP 1):

- Undertaking reconciliations against audited financial statements, trial balances, or other relevant records, if these are available;
- Testing the data for reasonableness against external or independent data;
- Testing the data for internal consistency; and/or,
- Comparing the data to that for a prior period or periods.

The extent of the checks to be carried out is a matter of judgement and will depend on matters such as:

- Purpose the assumptions will be used for;
- Understanding of the process involved in creating the data;
- Source of the data;
- Nature of the assumption review;
- Extent and nature of checks known to have been carried out by other parties; and/or,
- Materiality of the assumption being used.

As an example, a split between acquisition and maintenance expenses may be provided by Finance who do not require such a split for their own reporting. In such a scenario, it is worthwhile for the actuary setting an expense assumption basis to consider the reasonableness of the methods used to apportion the split since the importance to the actuary may not be well understood by the data provider.

As part of the validation, consultation with others on the outcome can be a valuable exercise. For example, meeting with claims staff may provide useful background for emerging trends or explain some unusual movements e.g. a large reduction in pending claims.

Consistency between the experience analysis and projection model is important. Where possible, a control may be worthwhile on reconciling the data in the experience analysis and the data within the projection models.

It is important to assess whether externally sourced data is reliable. It may have been gathered for some purpose that did not require the level of rigour appropriate to the purpose to which it is being used.

5.6. Data deficiencies

It is worthwhile considering the possible effect of any data deficiencies. Examples of data deficiencies are inadequacy, inconsistency, incompleteness, inaccuracy and unreasonableness. If such deficiencies in the data will not materially affect the results, then the deficiencies may not require further consideration.

It is important to consider whether the reliability of the data can be improved by adjusting or supplementing it, and the costs and benefits of such efforts. An example of a way in which data could be adjusted is the use of average values in place of invalid or missing entries for a small subset of policy data. This avoids having to lose other policy information for affected policies. Data might be supplemented using additional sources of data, proxies or sampling methods, though the relevance of additional sources of data may need to be considered.

If a satisfactory way to resolve the deficiencies cannot be found, then the actuary may wish to consider whether to:

- Benchmark against data for products thought to be similar;
- Obtain appropriate additional data; and/or
- Subject to compliance with the Actuaries Institute's suite of professional practice documents, perform the actuarial services as well as possible and disclose the data deficiencies in the report (including an indication of the potential impact of those data deficiencies).

Reinsurers will usually have some additional data limitations to consider and manage compared to direct insurers. Generally, the three main differences will be operational delays, data granularity and data consistency across multiple cedants. It can be helpful for the consequences of such limitations to be communicated to, and mitigated, by colleagues liaising with cedants.

There is sometimes an issue with grouping data to achieve credibility but at the expense of losing information about any underlying diversity. The implications of the lost granularity may require assessment, which could involve consideration of how the assumptions will ultimately be used.

6. Analysing experience

This section is primarily relevant for the review of demographic assumptions, as opposed to expense assumptions. As with other sections of this TP, the actuary is expected to apply judgement in determining the relevance of this section given the materiality of an assumption and the purpose for which it will be used.

6.1. Purpose of experience analysis

An often important component of assumption setting is to first arrive at an understanding of past experience. The benefits that can be gained from analysing past experience is the identification of historical:

- levels of experience;

- trends in experience;
- drivers and risk factors behind experience and trends in experience;
- interactions between variables;
- volatility of experience;
- effects of change in business processes and benefit design; and/or,
- impact and distribution of one-off events (e.g. pandemics, catastrophes, regulatory changes).

The objective is usually to obtain from the data the most relevant analysis/information to inform the selection of future assumptions. The analysis/information can also be used to provide strategic advice to the business for action.

In some cases, changes (e.g. to benefit design) may be incorporated through adjustments to the experience investigation and/or the data used for it. This reduces the need to make further adjustment or allowance to the experience investigation results. For example, if removing a benefit or condition when a benefit gets paid, it may be possible to allow for this by removing claims paid under this condition from the data in the experience investigation.

6.2. Extent of analysis perform

When assessing the depth of analysis required to derive particular assumptions, consideration may be given to their materiality, for each intended use. For Australian financial reporting, the balance sheet impact of an assumption change in a financial year will depend on the valuation approach adopted (i.e. accumulation or projection method), measurement model (i.e. premium allocation approach, variable fee approach or general measurement model), level of aggregation of insurance contracts, the coverage units and how close to being onerous the subset of business is (i.e. remaining contractual service margin or CSM). Additional work may be appropriate when a block of business is close to being onerous given the financial reporting consequences.

Under AASB 17, changes in assumptions could impact the risk adjustment, liability for remaining coverage (LRC) and consequently the CSM, and the liability for the incurred claims (LIC).

Care is expected to be taken when assessing impacts at a point in time. At the time of an assumption's initial implementation, there might be limited exposure to claims in payment for long durations, but as a subset of business matures, exposures might change and previously immaterial assumptions might become significant.

These considerations on the materiality of impacts are relevant when assumptions are updated.

6.3. Available tools and techniques

A number of analytical tools and techniques are available to assist the actuary. Current commonly used techniques include univariate and multivariate analysis and statistical credibility theory. Other techniques which may be considered include, but are not limited to, Bayesian network modelling, supervised and unsupervised machine learning, Monte Carlo simulation, and constrained optimisation.

Details on commonly used machine learning techniques and their applications, benefits and limitations are included in Appendix B.

6.4. Considerations when selecting tools and techniques

When assessing which modelling tool or technique to apply, an actuary may consider the following points:

- Use of a range of models to better understand any underlying driver of experience and the suitability of various models to particular circumstances and trends;
- Understanding the strength, weaknesses and any underlying explicit/implicit assumptions of any tool/technique applied, for example in estimations of IBNR feeding into 'actual' claims results;
- Checking that experience analysis models have been applied correctly, including issues such as IBNR / RBNA adjustments for claim incidence assumptions and reopened claims adjustments for termination assumptions;
- Validating analysis which explains how the experience analysis model is a satisfactory representation supported by techniques such as:
    - comparing the outputs of analytics with actual experience and actual analysis of profit results;
    - quantitative analysis of the predictive properties of the model using back-testing;
    - analysis of movements; and,
    - sensitivity testing.
- Maintaining controls over experience analysis models used, such as maintaining a version history and peer-reviewing updated inputs and methodology changes; and,
- Maintaining records of advanced analytics models in terms of data pre- and post-processing, feature engineering, model architecture, hyperparameters, model selection criteria, ethical considerations and such that model outcomes are transparent, usable, unbiased, compliant with regulations and explainable to stakeholders. There may be other considerations, for example being able to replicate results, that are relevant.

6.5. Procedural records

It is advisable to maintain records of the procedures performed to arrive at the final experience investigation outputs. The records might come in a number of formats and could include:

- Annotation - where appropriate within models for data extraction, grouping of products and merging with other datasets. This is particularly helpful for program routines and scripts, but also for spreadsheet calculations that may not be obvious to another similarly experienced actuary;
- Process records that are complete, consistent with actual practice and may otherwise allow another similarly experienced actuary to re-perform the experience analysis; and,
- A log of known limitations of data and models being maintained and regularly re-visited. The log could include any adjustments, approximations or assumptions made.

7. Setting the assumption

This section is primarily relevant for the setting of material assumptions. As with other sections of this TP, the actuary is expected to apply judgement in determining the relevance of this section given the materiality of an assumption and the purpose for which it will be used.

7.1. Model requirements

When constructing an assumption set, the actuary is expected to consider its relevance to its intended use. Examples of considerations include:

- Whether the weighting applied in the experience investigation is consistent with how it is applied in the model, for example by policy count or by premium.
- Whether the products have sufficiently different characteristics and credible data to require more granular separation of experience results.
- Whether adjustments are required for inflationary purposes given the point in time the assumption will apply from, for expenses for example.
- The importance of granularity of the assumption set. For instance, there may need to be greater focus on on-sale or loss-making business. For pricing, a higher level of granularity may be required than for valuation if an understanding of the profitability contribution of particular product features or pricing points is desired.
- The homogeneity of assumption groups, and whether cross-subsidies within an assumption group will change over time.

If in doubt, the actuary preparing the assumptions would typically consult with the model developer or the performer of the experience investigation.

7.2. Applicability of the results of experience analysis

The results of experience analyses are often the starting point for an actuary's assumption setting process. However, past experience is not always a good indicator of future outcomes. Therefore, the actuary may adjust the results of experience analysis by taking into consideration both internal and external factors that could affect future experience.

The internal factors mainly relate to company specific considerations and these include:

- Changes to product design, policy interpretation and business processes such as claims definitions, underwriting eligibility, claim eligibility and claims handling procedures that may affect future claim costs compared to past experience;
- Investment in retention initiatives that may lead to lower lapse rates compared to past experience; and,
- Changes to the business mix as a result of shifted target market or writing business through different distribution channels.

The external factors can often be identified by conducting an environmental scan and these include:

- Changes to regulation that may affect new business volumes and expected lapses compared to past experience;
- Expected changes to the economic environment, such as unemployment rates, that may have an effect on savings rates and claim costs;
- Possible change in policyholder or beneficiary behaviour that may impact claim costs including second-order impacts from changes in business mix; and,
- Medical advances including diagnostic tools and changes in medical definitions that may affect the incidence of claims.

7.3. Setting the Assumptions

In addition to adopting a forward-looking view when setting the assumptions as outlined in Section 7.2, the following considerations could also be taken into account.

- The number of years of experience over which to base an assumption upon.
- The level of granularity at which the assumptions are set.
- The selection of rating factors that are most relevant to the company.
- Interaction or correlation between the assumptions.
- The compatibility of the systems and complexity in modelling the assumption set.

- What credibility to apply where internal experience is not available or lacks statistical credibility. Life insurers often face challenges with insufficient credible data at granular levels, requiring data grouping into higher levels to generate meaningful insights. A common method for assessing data credibility is estimating the extent of random variation within the data – larger variations indicate lower credibility. To address these credibility challenges, insurers may use industry studies, or engage reinsurers or external consultants, who typically have extensive international experience and robust data, enabling more credible assumption setting. For instance, an assumption may be set by taking a weighted average of both the insurer's and external source's experience, with the weighting parameters adjusted based on the credibility of each data source. More detail on credibility theory including credibility models an actuary may wish to use can be found in some of the linked references under the Advanced machine learning models and credibility section of Appendix A.
- Any 'one-off' adjustments required to remove outliers or non-repeating items.
- Adjustments to take account of tail outcomes that may not be adequately represented in an observed sample.

In each case, it can be helpful to record and/or disclose any material judgement applied, why it has been applied and how sensitive the outcome is to the judgement applied.

7.4. Dealing with uncertainty in setting the assumptions

Due to the inherent uncertainty in setting the assumptions, the actuary may consider the degree of uncertainty in each assumption, the potential effects of experience being adverse, the entity's ability to absorb adverse experience and the view of the regulator regarding uncertainty[3]. The actuary may employ dynamic tools such as sensitivity testing to assess the risk and quantify the impact accordingly.

The actuary may also comment on the limitations of an experience study and specify that close monitoring of experience is required. Where a life company has no relevant experience data on which to base assumptions, the actuary may take into account statistics relating to similar events or conditions that can be obtained and considered relevant.

When dealing with highly uncertain assumptions including future trends, uncertainty could be allowed for by:

- Including some additional allowance in the assumptions to reflect the probability weighted claims cost being more likely to increase as a result of uncertainty than reduce (noting the requirements around best estimate assumptions under various regulatory and reporting standards, for example, AASB 17 requires estimates of future cash-flows to be the probability-weighted mean, and uncertainty could instead be reflected in the Risk Adjustment);

[3] APRA's letter of 7 December 2023 'Sustainability of life insurance in superannuation' highlighted uncertainty arising from the COVID-19 pandemic impacting premium volatility in group insurance.

- Including some additional allowance in the pricing margins to allow for the cost of uncertainty because claims cost assumptions are not true best estimate; and/or,
- Increasing capital requirements to reflect the degree of uncertainty inherent in the best estimate assumptions.

The approach taken to allowing for uncertainty can be clearly recorded with supporting rationale and disclosed to relevant stakeholders.

The actuary may also want to consider interactions between areas of uncertainty in the assumption setting. For example, where multiple areas of judgement have been applied across an assumption set, or across assumption sets relating to various products within a portfolio. The possible range of outcomes across all areas of uncertainty may be combined via sensitivity testing to provide the relevant stakeholders with a holistic view of the uncertainty in the assumption setting. The actuary may also consider highlighting the level of potential conservatism or aggressiveness applied in each of the judgement areas, so that a view may be formed as to whether all judgement areas considered in totality form a balanced view.

7.5. Consistency across assumptions and time

Consideration may need to be given to the consistency and reasonableness of the outworking of the assumption set. For example, the projected margins on cohorts of unit linked business can become excessive where income and expenses are projected with different drivers.

Another consideration is whether the projected profitability is likely to be achieved, or whether the company is able to take management actions that can be reflected in the assumptions, or whether competitive pressures need to be reflected in the assumptions.

A further question is whether the assumption set will remain suitable in the future, assessing cohorts of the insured population for which the assumption may not be appropriate, and considering whether these cohorts will become more or less significant going forward.

8. Review and approval considerations

This section is primarily relevant for the review and approval of major assumption setting exercises, such as the annual review for policy liability assumptions. As with other sections of this TP, the actuary is expected to apply judgement in determining the relevance of this section given the materiality of an assumption and the purpose for which it will be used.

8.1. Review

There can be control benefits from checks and procedures existing for calculations and sourcing of data. Depending on the area in which the actuary works, others may automatically review the derived assumption set, such as the Appointed Actuary or external auditor. Notwithstanding any existing or statutory reviews, it may be worth considering the extent to which other reviews are required to help achieve material accuracy, reasonableness and completeness of the investigations and the reasonableness of the proposed assumptions.

The review may be for the entire assumption setting process, or for specific areas. Areas that are often subject to review are:

- Judgement applied in forming the assumption set;
- Models used to perform the experience investigation;
- Checks and controls applied by the actuary; and,
- Assumption records and disclosure completeness.

Factors that may affect the actuary's determination on whether a review is required for an area of the assumption setting process could include its materiality, complexity, proneness to error, extent to which judgement is applied and the effectiveness of current controls. Other factors include the reasonable expectations of users of the information and the recentness of any past review. When considering who is to perform the review, factors that might be considered are the reasonable expectations of other stakeholders towards the independence and technical knowledge of the reviewer.

8.2. Consistency between the way assumptions are set and used

It is critical that there is consistency between the way assumptions are set and the way that they are used. While achieving consistency may not be the explicit responsibility of the person carrying out an assumption setting exercise, it is critical that care be taken to avoid inconsistencies arising.

8.3. Approval process

Material assumptions recommended for use in calculation of certain key results will often pass through an approval process before implementation. This approval framework may include the Actuarial Advice Framework[4], Board product or pricing policies, etc. and will vary by company.

[4] APRA Prudential Standard CPS 320 'Actuarial and Related Matters' requires an insurer to have a board-approved framework for the provision of actuarial advice (Actuarial Advice Framework) which identifies areas where the advice of an actuary is required and matters to be considered in the provision of such advice.

When planning the assumption setting process, it may be helpful to consider what analysis and support may be needed by the approver(s), and plan time for appropriate review and approval.

9. Assumption records and disclosures

Different records and disclosures relating to proposed assumptions may be produced for different purposes or audiences, but in aggregate, these form the assumption records and disclosures.

Assumption records and disclosures can play a pivotal role in the assumption setting and approval process. As such, these records and disclosures may perform the following functions:

- Communication tool to users of the assumption information;
- Communication tool to reviewers or approvers of the derived assumption set; and,
- Evidence for work performed.

The most effective disclosure will be that which is transparent and targeted to the audience. It may be beneficial for results to be presented in a manner that allows each intended stakeholder to place a high degree of reliance on the relevance, transparency, completeness and comprehensibility of the assumptions. This might include the communication of any inherent uncertainty, to allow each stakeholder to draw their own conclusions.

Ultimately, it can be a good target for records and disclosures to be at a level such that a technical, competent person with no prior knowledge of the assumption set could understand the reasons for decisions made and assess the judgement applied.

The style and structure of the assumption records and disclosures can be important. Non-material information is worth excluding or minimising to avoid obscuring material information.

Records and disclosures for a larger-scale assumption setting exercise could cover the following areas:

- **Purpose and scope of review**, including anticipated uses of derived assumptions.
- **Recommendations**, to improve the data, processes, modelling etc.
- **Compliance statements,** setting out which Prudential Standards, regulation and / or professional standards the records and disclosures are required to comply with.
- **Summary of assumption changes** from the current assumption set, including an explanation or quantification of financial impact. Where an impact may not affect the initial purpose of the basis, but may have other consequences, it is best to highlight this to avoid later problems; for example, a lapse assumption change may have a low impact for insurance contract liabilities but have more impact on contractual service margin and product profitability testing. Additionally, better practice is for the impact to be calculated on all relevant reporting bases.

- **Key areas of judgement applied.**
- **Description of each assumption type,** this may include an explanation of its importance and comment on any asymmetry that may exist in terms of the assumption's impact on modelling.
- **Description of the data used** to derive the assumption. This may include sources of information, date that the data set covers, extent to which manual adjustment performed (e.g. removal of unusable data), checks performed on the data, consistency (or otherwise) of the data with that used for other purposes and any uncertainty there is over the accuracy of the data.
- **Derivation method,** particularly where an assumption is being used for the first time, or there are significant changes in approach from previous assumptions.
- **Results of experience analysis** including credibility of the results, any statistical tests performed and the presence and consequence of any significant trends and features of the experience. Comparison of expected past experience using the recommended assumptions with actual past experience, and key reasons for significant differences.
- **Comparison to external experience** where relevant and possible, for example with benchmarking surveys.
- **Description of relevant external factors**, for example, forthcoming regulation or industry trends observed amongst peers.
- **Assumption setting methodology,** areas that may be expected to be covered are the period that average experience is taken from, the extent to which external environment factors have been considered, areas where judgement was applied and explanatory variables considered but rejected.
- **Sensitivity of assumption** to changes in methodology or judgement. Examples are using a different period for assessing average experience, or applying judgement in the weight attached to data sources used.
- **Results sensitivity to assumption.** Alternatively, this may be provided as part of a results report.
- **Known limitations** of analysis performed. For example, if a large element of the historic claims experience is IBNR, then the fact that the experience is itself based on an assumption is worth highlighting.
- **A list of assumptions** but may not be useful for some assumption records and disclosures, depending on the audience.

It is important for the user of the assumption records and disclosures to understand precisely what the assumption represents. This may include clear records and disclosures of:

- What the assumption represents, and how it interacts with other assumptions. For decrement assumptions, this may include what decrement events are covered/excluded. For a maintenance expense assumption, this may include whether the assumption is effective at the middle or start of the period.
- What the assumption was weighted by e.g. claim amounts or claim count.
- The effective term of the assumption: monthly rate, annual rate, or compound rate.
- Period the assumption is expected to be correct for. For instance whether the assumption will become out of date over time due to expected mortality improvements, or expected economic effects.

Depending on the stakeholder, it may be beneficial to convey to the audience:

- An explanation that assumptions can only represent an estimate of future experience, actual experience will be different and may be better or worse.
- Where an assumption has been provided by a different area of the business (e.g. projected sales volumes for business planning), what steps the actuary has taken to assess their reasonableness and what their conclusions on reasonableness are. In some circumstances, the actuary may decide they are not best placed to provide a view on reasonableness, whereby it is a sensible precaution to state this to avoid the perception that the actuary endorses the assumption, along with a summary of any information the assumption provider has given to support their assumption.
- A statement offering to make a full list of assumptions available on request (if these are not included in the disclosures already).
- How consistent the proposed assumptions are with other bases used by the company.
- A version history log for the records and disclosures indicating who has reviewed and when.

Additional care may be helpful with regards to checking the records and disclosure are appropriate for the stakeholder. This might include considering the language used in records and disclosures, and how technical terms are defined, and technical concepts explained.

Appendix A: Further reading

Accounting standard

- Australian Accounting Standards Board (2022). AASB 17: Insurance Contracts. https://www.aasb.gov.au/admin/file/content105/c9/AASB17_07-17_COMPdec22_01-23.pdf

Australian prudential standards

- Australian Prudential Regulatory Authority (2023). Life Prudential Standard LPS (115): Insurance Risk Charge. https://www.legislation.gov.au/F2023L00207/latest/text
- Australian Prudential Regulatory Authority (2019). Prudential Standard (CPS) 320: Actuarial and Related Matters.https://www.apra.gov.au/sites/default/files/cps_320_standard_only.pdf
- Australian Prudential Regulatory Authority (2023). Life Prudential Standard (LPS) 340: Valuation of Policy Liabilities.https://www.legislation.gov.au/F2023L00694/latest/text

Institute professional standards, guidance and learning references

- The Institute of Actuaries of Australia (2021). Professional Standard PS 201: Actuarial Advice to a Life Company or Friendly Society. https://content.actuaries.asn.au/resources/resource-ce6yyqn64sx3-2093352434-60085
- The Institute of Actuaries of Australia (2021). Technical Paper: Analysing Disability Income Experience and Setting Best Estimate Assumptions. https://content.actuaries.asn.au/resources/resource-ce6yyqn64sx3-2093352434-56505

This paper provides information on issues to consider when reserving for disability income products and analysing claims experience to assist with setting assumptions regarding future claims experience.

- The Institute of Actuaries of Australia (2021). Technical Paper: AASB 17 Insurance Contracts. https://content.actuaries.asn.au/resources/resource-ce6yyqn64sx3-2093352434-56412

This paper provides information on AASB 17 to assist actuaries working in Australia to meet the requirements of AASB 17 without heavily having to rely on other references such as IAN 100.

- The Institute of Actuaries of Australia (2016). Technical Paper: Framework for setting life insurance risk margins for regulatory capital. https://content.actuaries.asn.au/resources/resource-ce6yyqn64sx3-2093352434-56401

This paper provides information on the setting of risk margins for use in the calculation of the prescribed capital amount under LPS 110 (Capital Adequacy) and LPS 115 (Capital Adequacy: Insurance Risk Charge).

- The Institute of Actuaries of Australia (2014). Information note: IBNR. https://content.actuaries.asn.au/resources/resource-ce6yyqn64sx3-2093352434-56436

This paper provides information on a subset of available methodologies to determine the best estimate of IBNR reserves, and the associated advantages and disadvantages, applications and examples of each method.

- The Institute of Actuaries of Australia (2021). Technical Paper: Asymmetric Risks. https://content.actuaries.asn.au/resources/resource-ce6yyqn64sx3-2093352434-56467

This paper provides information on the issues when assessing asymmetric risks for, in particular, determining policy liabilities, economic valuations, product pricing, bonus philosophy and setting investment policy.

- The Institute of Actuaries of Australia (2023). Technical Paper: Discount Rates for APRA Capital Standards. https://content.actuaries.asn.au/resources/resource-ce6yyqn64sx3-2093352434-56457

This paper provides information on issues in determining discount rates (pre allowance for any applicable illiquidity premium) under regulatory prudential capital standards effective 1 January 2013.

- The Institute of Actuaries of Australia (2023). Technical paper: The Development and Use of Volatility Assumptions. https://content.actuaries.asn.au/resources/resource-ce6yyqn64sx3-2093352434-56479

This paper provides information on issues in developing and using volatility assumptions.

- The Institute of Actuaries of Australia (2023). Technical paper: Climate Change for Appointed Actuaries. https://content.actuaries.asn.au/resources/resource-ce6yyqn64sx3-2093352434-56329

This paper provides information to assist Appointed Actuaries in understanding climate risks and opportunities.

- The Institute of Actuaries of Australia (2011). Practice Guideline: Economic Valuations. https://content.actuaries.asn.au/resources/resource-ce6yyqn64sx3-2093352434-55323

This paper provides guidance to support carrying out economic valuations of economic assets.

- The Institute of Actuaries of Australia (2023). Practice Guideline: AASB 17 Insurance Contracts. https://www.actuaries.asn.au/Library/Standards/MultiPractice/2022/20220124PG4.pdf

This paper provides guidance to Members when performing applicable services in relation to AASB 17.

- The Institute of Actuaries of Australia (2022). Practice Guideline: Target Capital Life, General and Health Insurance.https://content.actuaries.asn.au/resources/resource-ce6yyqn64sx3-2093352434-17912

This paper provides guidance to Members in developing target capital policies for general, life and health insurance companies.

- The Institute of Actuaries of Australia. Life Insurance and Retirement Product Development, (2023 ed.) Module 8.

The text book Module 8 covers the experience analysis and assumption setting for discontinuances and lapses, mortality, morbidity, expenses and economic assumptions.

General Insurance professional standards

Gives a clear description of the concept of the Central Estimate of a liability, which is similar to the concept of a Best Estimate Liability.

- The Institute of Actuaries of Australia (2023). Professional Standard PS 302: Valuations of General Insurance Claims. https://content.actuaries.asn.au/resources/resource-ce6yyqn64sx3-2093352434-55724

International references

- Board for Actuarial Standards (2023). Technical Actuarial Standards, Financial Reporting Council. https://www.frc.org.uk/library/standards-codes-policy/actuarial/technical-actuarial-standards/

This set of papers provides UK standards for actuarial work falling within its scope covering scrutiny and checking of data, and actions taken if data is inaccurate or incomplete.

- Board for Actuarial Standards (2023). Technical Actuarial Standard: Models, Financial Reporting Council. https://media.frc.org.uk/documents/TAS_Guidance_Models_effective_1_July_2023.pdf

This paper provides UK modelling standards for actuarial work falling within its scope.

- International Actuarial Association (2018). International Standard of Actuarial Practice 1: General Actuarial Practice. https://www.actuaries.org/IAA/Documents/CTTEES_ASC/Final_ISAPs_Posted/ISAP1_Review_adopted_1Dec2018_V2_16April2019.pdf

This paper provides guidance on general actuarial principles when carrying out actuarial services.

Advanced machine learning models and credibility

This paper is written for the practicing actuary who would like to understand generalized linear models (GLMs) and use them to analyse insurance data.

- Willis Towers Watson (2007). A Practitioner's Guide to Generalized Linear Models, 3rd Edition. https://www.casact.org/sites/default/files/database/dpp_dpp04_04dpp1.pdf

A large number of references on credibility are available on the Society of Actuaries website.

- Mahler. H C. and Dean. C. G. (2001). Credibility. Society of Actuaries, Chapter 8 Study Notes. https://www.soa.org/493903/globalassets/assets/files/edu/c-21-01.pdf

This paper provides a comprehensive explanation and examples of credibility models including the classical credibility model and Buhlmann (Bayesian) credibility, as well as practical issues in the application of credibility theory including some examples of how to calculate credibility parameters.

- Taylor. G. (2015). A few basics of credibility theory. Institute of Actuaries of Australia. https://content.actuaries.asn.au/resources/resource-ce6yyqn64sx3-2093352434-28328

This presentation covers a few of the fundamental concepts of credibility theory.

- Taylor. G. (2007). Computation of Credibility Coefficients for Pricing. Institute of Actuaries of Australia. https://content.actuaries.asn.au/resources/resource-ce6yyqn64sx3-2093352434-26124

This presentation provides examples of credibility applied to pricing.

- The Actuaries Institute of Australia (2022). Information Note: Artificial Intelligence and Discrimination in Insurance Pricing and Underwriting. https://content.actuaries.asn.au/resources/resource-ce6yyqn64sx3-2093352434-17914

This paper provides information on risks of algorithmic bias and practical steps to avoid unlawful discrimination when using artificial intelligence.

- Society of Actuaries (2019). Machine-Learning Methods for Insurance Applications: A Survey. https://www.soa.org/globalassets/assets/files/resources/research-report/2019/machine-learning-methods.pdf

This paper provides information machine learning model fundamentals and their application in insurance.

- The Institute of Actuaries of Australia. Data Science Application, (2023 ed.) Modules 5 and 6. The textbook Modules 5 and 6 cover the supervised and unsupervised machine learning techniques and provides examples of their applications in the insurance industry.

Appendix B: Analytical tools and techniques

Technique	Type	Potential Usage	Benefits	Limitations
Generalised Linear Models	Supervised	Analysing claim experience and predicting life insurance premiums by risk factors e.g. age, sex and occupation	Simple to implement and interpret; good for linear relationships	Not suitable for complex, non-linearity
Decision Trees	Supervised	Risk classification and decision making	Easy to understand and visualize; handles both numerical and categorical data	Prone to overfitting; can be unstable with small changes in data
Ensemble Models	Supervised	Random Forest, Gradient Boosting etc. in experience analysis and settings	Improved predictive accuracy	Computationally intensive; less interpretable and prone to overfitting if not properly tuned
Neural Networks	Supervised	Complex pattern recognition for underwriting and fraud detection	Can capture complex non-linear relationships; highly flexible	Requires large amounts of data and computational power; less interpretable and prone to overfitting
Support Vector Machines	Supervised	Classifying risk categories and detecting anomalies	Effective in high-dimensional spaces; robust to overfitting	Not suitable for very large datasets; choice of kernel can be critical
K-Nearest Neighbours	Supervised	Customer segmentation and risk classification	Simple and intuitive; no training phase	Computationally intensive; sensitive to noise and irrelevant features
Clustering (e.g., K-Means)	Unsupervised	Segmenting policyholders into distinct groups for targeted marketing	Simple to implement; useful for discovering natural groupings	Requires specifying the number of clusters; sensitive to initialisation
Principal Component Analysis (PCA)	Unsupervised	Reducing dimensionality of data for visualization and modelling	Reduces complexity; helps in visualizing high-dimensional data	Can lose interpretability; assumes linear relationships among variables

Technique	Type	Potential Usage	Benefits	Limitations
Autoencoders	Unsupervised	Reducing dimensionality of data for summarisation; anomaly detection	Reduces dimensionality; addresses non-linear relationships	Requires significant training data; computationally intensive; less interpretable
Gaussian Mixture Models	Unsupervised	Modelling the distribution of policyholder attributes for risk assessment	Can model complex, multimodal distributions; flexible	Computationally expensive; sensitive to initial parameter settings
Association Rule Learning	Unsupervised	Identifying patterns and correlations in policyholder behaviour e.g. lapsation	Can discover interesting relationships; useful for market basket analysis	Can produce a large number of rules; may require domain expertise to interpret
Bayesian Network	Both	Identifying relationships and dependencies between risk factors; dynamic assumption updating	Models complex relationships; updates with new data; visual representation of interactions	Requires expertise; computationally intensive

END OF TECHNICAL PAPER