# LIFE INSURANCE AND RETIREMENT VALUATION

**MODULE 10: VALUATION PROCESS**

Education Program
ACTUARIES INSTITUTE

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# Module 10

# VALUATION PROCESS

# Table of contents

# 10.  Valuation Process

This module addresses the following learning objectives:

| Item | Unit/Key Performance Objective/Learning Objective |
|---|---|
| **3.8** | **Design a valuation framework including data, systems and controls** |
| 3.8.1 | Understand the steps and key interactions of a valuation process |
| 3.8.2 | Evaluate and apply data grouping techniques for use in valuation |
| 3.8.3 | Assess and apply techniques for the validation of valuation input data |
| 3.8.4 | Critique the features of valuation systems |
| 3.8.5 | Assess and select valuation modelling applications |
| **3.9** | **Develop a plan for a year end valuation** |
| 3.9.1 | Assess and adapt the key stages in the planning process for an annual valuation for a life company with a diverse portfolio |
| 3.9.2 | Assess the business considerations and impacts of the external environment for each step of the valuation process |
| **3.10** | **Analyse and explain the results of a valuation, internally and externally** |
| 3.10.1 | Assess and select appropriate levels of aggregation for intermediate results and reporting |
| 3.10.2 | Select appropriate validation techniques to apply to the results of a valuation |
| 3.10.3 | Compare to previous valuation results to evaluate reasonableness and explain changes |
| 3.10.4 | Decide on appropriate presentation and reporting for the communication of results to internal and external stakeholders |

Previous modules have looked at valuation methodologies and assumptions in some detail. This module covers the overall valuation process, from data collection through to result generation.

# 10.1. Valuation framework

## 10.1.1. Process steps

Figure 10.1 outlines the major steps in the valuation process.

**Figure 10.1: Steps in valuation process**

| | |
|---|---|
| **Project plan** | • Prepare a valuation process flow document<br>• Prepare a project plan, including project purpose, scope and requirements, key roles, stakeholders and dependencies, timeframes, steps, milestones, sign-offs, and computer and other resources |
| **Scan environment** | • Consider and address changes that may impact the valuation either directly or indirectly, from both internal and external sources<br>• Review the findings from the last valuation and any file notes |
| **Modification and testing of models** | • Review system requirements<br>• Conduct test runs to ensure systems are working correctly<br>• Ensure any manual or spreadsheet processes are updated and operationally ready |
| **Data preparation** | • Source data, including company or fund information and external data such as economic and market data<br>• Conduct reconciliations<br>• Conduct other data validation checks<br>• Prepare data for modelling and conduct validation checks on any required data transformation processes |
| **Assumption setting** | • Analyse experience; e.g. claims lapses and expenses<br>• Gather data and conduct investigations for economic/financial market assumptions<br>• Update valuation assumptions |

| | |
|---|---|
| **Asset valuations** | • Assess asset valuation results and methodologies and their consistency with the methodologies and assumptions applied in the valuation of liabilities |
| **Run model** | • Perform valuation runs; sequenced as appropriate where intermediate results are required<br>• Consider bonus policy for life company participating business and its impact on valuation results. Perform any necessary valuation runs and analysis. |
| **Analyse results** | • Analyse and validate results and develop insights into their important drivers<br>• Review/challenge any aspects of the results that do not make sense. Consider the reasonableness and materiality of results, taking into account results from any sensitivity testing. |
| **Finalise** | • Finalise results and assess any valuation adjustments needed following internal review processes and discussions |
| **Report** | • Ensure that results are populated into any downstream storage databases and/or reporting systems<br>• Prepare internal reports and statutory disclosures<br>• Consider and document any important events occurring after the valuation date |
| **Audit** | • Internal peer review of the valuation and results<br>• External auditor review of results which may include an independent actuary review |

## 10.1.2.  Process timeframes

For a life company or retirement fund, liability valuation results are just one part of a company or fund's financial reporting. The annual, quarterly or monthly liability valuation process forms part of a wider cycle of financial reporting and disclosure across the company or fund. The valuation of policy liabilities may be the starting point in a reporting process that includes valuation of solvency liabilities, determination of internal capital margins and calculation of life insurance appraisal values.

As computers have enabled more automation, process timeframes have reduced. Company or fund reporting activities tend to be managed nowadays within a very tight timeframe. Timeframes will be impacted by rules covering the timing of disclosures to regulators and, if relevant, the stock market. Parent and related company reporting timeframes will also impact on delivery timescales. The timing of the valuation of retirement fund liabilities for the fund's financial statements may coincide with a range of other company reporting requirements and consideration needs to be given to when the fund liabilities are required for the sponsoring employer's financial statements.

Company resourcing will be strained during this period. Also, an actuary may need to provide defined benefit valuations for many clients within a short timeframe, particularly if they all have the same year end dates.

An advantage of using a tight timeframe is that results are very relevant and up-to-date when released to the market. Another advantage is that any disruption to normal business activities during the reporting period is restricted to a short period of time. However, the reporting process, especially at a year end, may still take many weeks to complete. There is also a period of review, company approval and sign-off (including external audit review).

Ideally, many of the processes supporting the valuation, such as updating of projection models and claims experience analysis and investigations, will be scheduled throughout the year. This will reduce work requirements and pressures at reporting dates. Other processes that depend on data feeds as at the reporting date, such as data preparation and reconciliation, will need to be conducted during the tight reporting timeframe.

Financial reports are historical. They represent a summary of the position of the company or fund at the reporting date and the financial transactions that occurred since the previous reporting date. The reporting date can be considered a "cut-off" date where only transactions occurring up to this date are included.

In practice, a cut-off date may occur a few days prior to the reporting date, to allow valuation and reporting activities to be completed on time. Any transactions or matters arising between the cut-off and reporting dates are likely to be immaterial. If a material matter does arise, the results should be updated to reflect this.

There are many business issues where the treatment at the reporting date can materially affect the results. For example, a decision may need to be made in relation to the treatment for reporting purposes of a sizable reinsurance recovery, where some dispute exists as to the reinsurer's liability. Another example may be the discovery of a unit pricing error where the size or impact has not yet been assessed. The approach taken to estimating a value for such items requires considerable judgement. A conservative approach for a disputed reinsurance claim would be to allow for no reinsurance recovery until the counterparty has accepted the liability. The cost of a unit pricing error may be based on the cost of similar errors in the past. This may come from company records or information from the industry.

Numerous decisions need to be taken regarding whether a transaction is reported in the current period or the next period. As an example, the declaration of dividend payments on equity investments occurs some time before payment of those dividends. The treatment of dividends declared before the reporting date but paid afterwards needs to be considered. Another example might be a sizable claim lodged shortly after the valuation date. Often, the relevant accounting or actuarial standards will determine the correct approach; however, there will be many situations where judgement is required.

> **Exercise 10.1**
>
> There are other business issues where judgement is required and the treatment at reporting date can materially affect the results. For example, a sizable reinsurance recovery may be under negotiation where dispute exists as to the reinsurer's liability. Consider how this would affect the results. What would happen if the issue was settled after the valuation date but before the release of the results?

## 10.1.3. Environmental impact

The actuary should consider changes that may impact the company valuation either directly or indirectly, from both internal and external sources. Examples of internal changes include changes to reinsurance arrangements, changes in administration or accounting systems, changes to business operations, and product or retirement fund rules. Examples of external changes include changes to the current economic or business environment, taxation and regulatory changes.

## 10.2. Valuation system requirements

The valuation system generally refers to the whole functionality of the system or network of systems supporting the valuation. This includes, for example, reporting and connectivity with the running environment and other company systems. The valuation model refers to the modules or components of the valuation system that perform the calculations and generate results. Different organisations may differ in their use of these terms.

A selection of a completely new valuation system will be infrequent. However, existing valuation systems may need to be modified to incorporate changes to the running environment, business requirements or reporting requirements. The ongoing review of system capabilities would likely form part of the broader business planning process.

In selecting a valuation system, the following capabilities are important considerations. The system should:

- produce accurate results;
- generate results quickly, within required reporting timeframes;
- be economical to maintain, update and run;
- integrate with other systems such as data warehouses;
- provide results on alternative bases (for sensitivity testing, analysis of profit and valuation purposes);
- produce results in a format required for general purpose financial statements and regulator reporting;
- have the capability to produce the results, metrics and outputs required for local or other standards and regulations; and
- have the capability to produce stochastic modelling results and asset liability modelling.

When selecting a suitable system, compromises may be necessary. The approach and criteria adopted will vary between life companies and retirement funds, depending on such factors as the size and nature of the fund or business and the need to accommodate or integrate legacy (i.e. old existing) systems. Foreign-owned life companies may have to satisfy both local and overseas reporting requirements.

The purpose(s) of a valuation will be critical in designing or selecting a system and approach. For example, the valuation may be for external or internal users, for general purpose financial accounts, internal reporting or prudential reporting. The purpose will influence the format of results, materiality and possibly its data requirements and, therefore, impact on the system capability requirements.

For retirement funds, the abilities to model a range of funding methods, track coverage of member benefits using a range of measures and provide relevant fund- and member-level compliance reporting will be important.

## 10.3. Valuation models

### 10.3.1. Modification and preparation of valuation models

Preparation for the valuation may involve modification of valuation models. It will also include test runs to ensure systems are working correctly and that any manual or spreadsheet processes have been updated where required, to ensure that these are operationally ready.

Any model changes would be subject to a process of formal testing and sign-off, often including external review. Model changes and review would be conducted in advance of the formal valuation process.

### 10.3.2. Features of valuation models

The valuation model needs to be suitable for purpose, whether built internally, developed by adapting an external model, or purchased. Selection of an appropriate model requires judgement and consideration of the following:

- The **types of products or fund** to be valued, including the complexity of products, benefits and features.
- The **valuation methodology** to be applied, particularly whether it is projection or formula based, deterministic or stochastic. Stochastic models provide information on the distributions of possible outcomes. They can be used to value asymmetric risks such as financial guarantees, which are not readily modelled with a deterministic approach. However, they take longer to run and are more demanding in their use of computer resources.
- The **frequency of valuations** (e.g. monthly, quarterly, half-yearly or annually).
- The **output required**, including whether detailed, regular (e.g. monthly) projections of liability cash flows and other statistical information is needed for business planning and performance monitoring. Projected modelling results may include future asset values or claims costs. Comparison of actual results with projected results may also identify errors in models, data or reporting and, therefore, can be of value in the validation process.

Depending on the structure and functionality of the valuation system, potential models might also need to be able to:

- **communicate with other company or fund systems**, such as by sending and receiving of information smoothly;

- **incorporate local legislative requirements** for valuation and related calculations to meet capital and disclosure reporting requirements;

- **problem solve**, for instance, to calculate and use profit margins or bonus rates within a valuation run;

- **easily run sensitivity results** by changing assumptions and generating a series of deterministic results under different scenarios; for instance, it may be desirable to replicate the valuation using a range of discount rates and related economic assumptions;

- product results for an **individual member of a fund or a single policy** or a selected subgroup;

- **apply assumptions with flexibility and breadth**, such as duration-based investment earning or discount rates and duration-specific claims rates;

- reflect the **impact of reinsurance arrangements** at both individual and portfolio level; and

- be readily adaptable for a **variety of other purposes** such as economic valuation and pricing.

## 10.3.3. Spreadsheet models

Spreadsheet models have had a place in the actuarial tool kit for some time and continue to be used in a variety of ways: the valuation of simpler portfolios, checking of more sophisticated models, collation and presentation of results, intermediate calculations in a valuation suite of programs, "what if" scenarios, stochastic modelling and graphical presentation of results. Given the value of spreadsheets and their ease of use, there is a tendency for actuaries to overuse them in important operational systems.

Despite the ready accessibility of spreadsheets, their flexibility and ease of use, they have shortcomings as operational valuation systems. The nature of the tool (formulae relying on cell references, cell dependencies spread throughout multiple worksheets or spreadsheets, macros and cell coding, manual inputs and run steps) can make it difficult to detect errors. Version and audit control is less robust. Studies have shown that most spreadsheets used for business purposes contain undetected errors. The risk of undetected errors increases with the size and complexity of the spreadsheet.

Some of the key shortcomings of spreadsheets are summarised below:

- **slow processing times** – this can be a problem if individual policy projections and/or stochastic modelling are to be performed;
- **difficult to document well** – textboxes and comments are often used to document spreadsheets, but these are often not well structured and can be difficult to track;
- **poor version control** – change documentation is often not well maintained and unintended changes may be introduced;
- **poor management practices** – often spreadsheet models lack access controls and users with inadequate experience or coding skills may have access to modify cells and code;
- **inputs and outputs may not be clearly indicated** – hard-coded assumptions within formulae can be difficult to find and change;
- **difficulty in making modifications** – the cell-based nature with replicated formulae can make revisions both difficult and error-prone; and
- **system-generated audit trails** – the inability to produce an internal system-generated audit trail of changes creates issues and makes the audit process more problematic.

These issues associated with spreadsheets, combined with the complexity of valuation systems, leads to most companies and funds developing or purchasing proprietary valuation models, as discussed in the next section.

Where the scale of a retirement fund does not support the cost of proprietary models, off the shelf tools can be customised to enable quite sophisticated and streamlined valuations. For example, using visual basic and macros within an excel spreadsheet to automate calculations across members and projection years.

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## 10.3.4. Proprietary systems and models

Purpose-built or proprietary projection systems and models that are adapted to each company or fund's preferences and needs are now almost universally used as operational valuation systems. They are designed specifically for actuarial valuations. Proprietary models tend to use computer resources more flexibly, especially in an active running environment. For instance, proprietary systems may be designed to permit sequences of runs on different computers with programmed timing, such as overnight. They can also be designed to maximise processing speeds. Their use requires a more structured approach to documentation, planning and design. They can be designed to communicate with other systems.

Developers of proprietary models often have extensive experience in audit and change processes that was gained in an accounting or auditing environment. Audit features include change logs, date stamps, strong version control and archive processes. System design clearly separates various components such as assumption files, data input files and output files. Modelling generally follows a modern programming language using modular formulae with meaningful naming conventions that are created centrally once, rather than replicated in various cells throughout a spreadsheet. Documentation can be centralised and well structured, with descriptions of the operation of formulae and variables.

Proprietary models also tend to have tighter access controls, reducing the likelihood of unauthorised model changes. The main drawbacks of these models are the extra costs of purchasing and maintaining the software, and the need to train staff in their use.

### 10.3.5. Consistency between models

The range of different purposes of actuarial models, including pricing, funding, valuation of liabilities, appraisal values, capital management, performance reporting and business planning, can give rise to different models or different versions of models being used. This is especially true where functions are carried out in different parts of the company or fund. For example, while annual liability valuations may use a detailed modelling approach, simplified models may be adopted for internal performance reporting and business planning so that results can be obtained more quickly and/or on a range of alternative bases.

Regular consistency checks need to occur between models. It would be potentially damaging to the company or fund if different models produced materially different results to each other, particularly if those differences were not easily explained. Even where results are reconciled and found to be materially consistent, small inconsistencies can still create issues in managing stakeholder perceptions, such as those of regulators, shareholders or members. For instance, a product may be priced to achieve a certain planned profit margin. If a subsequent valuation estimates a different margin, this would require investigation.

Deliberate differences can arise due to the different modelling approaches required. Examples include the selection of model points and/or assumptions. For instance, pricing models may need to use a more detailed assumption set to produce more meaningful results for different customer cohorts.

To help ensure consistency or assist in understanding why inconsistencies exist, it is important that all assumptions are appropriately parameterised and clearly described in the model documentation. Hard-coding of model parameters is likely to lead to difficulties in interpretation and the variation of assumptions, which may cause errors.

An example of an assumption which may be inadvertently hard-coded is for stepped premium risk business projected to age 80, even though policies are renewable to age 99. Projecting only to age 80 may be a reasonable approach, especially where the contribution after age 80 is not material, as mortality and lapse rates can be very unreliable at higher ages due to the lack of relevant experience data. However, this assumption needs to be coded as a specific projection parameter: *term* or *projection age*. A hard-coded cut-off in the model at age 80 could give rise to later issues. The same model may be used to examine the impact of extending a benefit definition beyond age 80 and an incorrect conclusion may be reached if the model isn't updated appropriately.

# 10.4.  Valuation data

## 10.4.1.  Sources of valuation data

### Policy data

The valuation calculations will use data for each policy or member, for each contract in force at the valuation date. The information used for life insurance valuation purposes will vary according to the type of policy and valuation method. There needs to be sufficient information to project or calculate accurate liability values for the individual covered, taking into account their policy terms and conditions.

A company or fund's policy or member administration systems contain the policy member details necessary to perform a valuation. Valuation data is sourced from these administration systems. Generally, an automated data extract from the relevant administration systems will be created at each valuation date to provide the data required.

Valuation data extracts may need to source policy data from multiple policy administration systems. Some life companies have several administration systems to record data for different types of policies. This is often a result of merger and acquisition activity or the introduction of new products over time. It can be difficult and expensive to move policies from older systems to more modern ones.

As an example of data extract requirements, the data for yearly renewable term business is likely to include the following:

**Figure 10.2: Policy data**

| Data from policy administration sytems |
| --- |
| policy number |
| sex |
| smoking status |
| date of entry |
| date of birth |
| sum insured |
| base premium (i.e. before any extra premium) |
| extra premiums (if any) or policy loading / rating |
| policy fee |
| mode/frequency of premium payment |
| benefit indexation |
| type of cover and any additional rider benefit options |

Data is sometimes sourced from other systems. This data may be policy specific or may apply to groups of policies. Examples of policy data sourced from other systems are as follows:

- claims may be managed on dedicated systems, separate to policy administration systems. Individual claims data may be sourced for calculating outstanding claims provisions for known claims, whereas claims data for groups of policies may be used to derive run-off patterns for IBNRs. Claims Information may also be used for the analysis of profit; and

- reinsurance information may be managed wholly or partly on separate systems, relating either to individual policies or portfolios, according to the types of arrangements.

## Other reference data

Data relevant to the valuation and applying to whole series of policies is sometimes referred to as *reference data*. Examples are:

- for **traditional participating business**, additional information may be required regarding bonuses, interim bonuses and surrender values, although this may be available from policy administration systems; and

- for **investment-linked business**, the number of units of various types will be recorded. A data file of unit prices at the valuation date is required but these do not need to be included in the policy data, as the same set of prices applies to all policies. For investment account business, the account balance will be recorded. For both investment-linked and investment account policies, the amount of any surrender penalty at the valuation date, or data to calculate or estimate this, will be needed.

## Financial data

Depending on the valuation methodologies adopted, certain financial data may be required. This data may represent outputs of previous valuation or accounting processes and may be required at an individual policy or policy group level. Examples are profit margins, including any cumulative losses that need to be brought forward from the previous end of year valuation, and previous liability adjustments for DACs where relevant.

## 10.4.2. Data integrity

Datasets can vary widely in the extent to which they can be relied upon. Large life insurers and retirement fund administrators tend to have strong data quality control processes to ensure a high level of data integrity. However, even in these environments, data errors can occur. It is therefore important for actuaries to perform checks on any data they use to understand the extent to which its accuracy can be relied upon.

A starting point in the validation process is to understand from where the data has been sourced, the validation checks that have already been applied, and the extent that those checks can be relied upon.

A range of data checks will normally be carried out, including:

- reconciliation of "in-force" statistics at the previous valuation with those at the current valuation, using movement data for numbers of policies/members, premiums/contributions and/or sums insured;
- comparison of valuation data with other sources or directly with policy/member administration systems, either by sampling/spot checking or use of check totals;
- comparison of premium/contribution statistics (such as average in-force statistics at the start and end of the period) with actual premium or contribution income from ledger and supporting systems;
- checking of premiums or contributions recorded in the administration systems and ledgers against premiums or contributions calculated using the individual policy owner/member data in valuation systems;
- reconciliation of claims used in experience analyses (to derive assumptions) with claims from payments systems and ledgers;
- spot-checking of random records to ensure that data fields and their definitions align with their intended uses;
- checking for blanks, duplicates or data with obvious discrepancies, such as dates beyond the valuation date, birth dates that don't make sense and negative claim or benefit amounts; and
- calculating maximum, minimum and average values for certain numerical fields. Statistical distributions of data can also be investigated, such as those for gender, age and occupational category.

Data quality and accuracy impacts the reliability of the valuation results. It is important that errors are investigated and corrected. Understanding the cause of an error can be as important as its detection and rectification. Assessment will need to be made as to whether the error is an isolated event or is indicative of wider issues or inadequacies in processes or systems.

If the quality of data is poor, as indicated by unexplained reconciliation differences, or has missing or unreliable fields, the actuary may recommend additional liability margins to compensate for possible understatements of values based on poor-quality data.

As discussed in Module 6 (Profit), the liability valuation has a significant impact on the emergence of profit from period to period. Analysing profit against expectations provides valuable insight for managing the business. It also provides another source of analysis into the integrity of the valuation results and its underlying data. Techniques and methodologies for analysis of profit are covered in Module 12 (Analysis of surplus).

## 10.4.3. Grouping model points

Data from life insurance policy systems is converted into "model points" for valuation systems. A model point captures all the characteristics necessary for modelling: age, sum insured, premium, type of cover and so on. In the current environment, valuation projections are usually generated on an individual policy basis. Results are then summarised or aggregated into categories according to policy type for checking and presentation.

In the past, when computer power was more limited, it was often desirable to use model points based on the average characteristics of a group of individual policies with similar profiles. Grouping data for similar types of policies reduced computer resource requirements and runtimes.

In the current environment, grouping of data may still be useful. One example is for group risk schemes. For group risk schemes, individual data may be unavailable or of poorer quality and not reliable, in which case grouping of data may be necessary. Another example is stochastic modelling, which requires large numbers of simulations to be performed. This may not be efficient, or even possible, within required timeframes using individual data. Stochastic valuations are used more frequently to assess capital adequacy margins, where the shapes of the distributions of results, particularly the lower probability tails of distributions, are of particular interest. They may also be used to provide greater insight into likely future variations in employer contribution rates.

Where data is grouped, "model points" represent the average or total values of parameters applicable to a group of individual policies with similar characteristics. An example may be the grouping of yearly renewable term policies for a single age and gender. One model point may represent all male non-smokers currently aged 45. The model point may use an average age of 44.5 and average sums insured, premiums and durations. The liability value of the policies would be obtained by multiplying the result by the number of policies included in the model point.

Grouping introduces an additional layer of processing and approximation. Where lapse rates vary by duration, the accuracy of results based on an average duration would need to be tested. Similarly, mortality rates are likely to vary by duration as, for instance, the effects of underwriting are more pronounced at earlier durations.

Greater accuracy can be achieved by increasing the number of model points; for instance, by generating separate model points for a range of different durations, rather than using a single model point for the average duration. A compromise needs to be struck between greater accuracy (more model points) and shorter processing time.

Products with less complex modelling requirements may be represented by relatively few model points. Greater complexity may necessitate the use of larger numbers of model points. The size or materiality of the product line under consideration can also be an issue. For example, unbundled investment products could be modelled accurately with fewer model points than risk products. For risk product modelling, a range of factors need to be captured, including age, sex, smoking status and occupational class. Design complications for investment products that may need to be considered include early termination charges. Retirement business generally requires model points to be grouped according to attained age (or, alternatively, by entry age and duration), because termination rates peak when fund members reach retirement age.

Grouped model points require reconciliation based on key statistics, total sums insured, annual premiums and policy counts. Opening and closing positions on grouped data can be compared to those based on individual data. The grouping approach for a projection methodology would need to be validated by comparing the grouped valuation results with results based on individual policy projections. To reduce valuation time pressures, modelling validation can be carried out ahead of the formal valuation process.

## 10.5. Validating results

Validation and explanation of results is critical to every actuarial function. The steps involved in the validation of results include comparison with previous results and explanation of changes in surplus or profit arising during the reporting period.

Integrity of data and data reconciliation were discussed previously in this module. The techniques used in an analysis of surplus are covered in Module 12 (Analysis of surplus).

The steps that can be used in the validation of results include:

- reconciling data;
- peer or manager review of assumptions and inputs;
- peer or manager sign-off of key processes;
- spot-checking of results for individual policies or member projections;
- parallel runs on test systems;

- comparison with previous results, including analysis and explanation of profit or surplus arising during the period since the previous valuation;
- reviewing for reasonableness using totals and ratio checks applied to key measures such as premiums, sums insured or retirement fund member salaries; and
- independent and external audit review.

These validation options are summarised in Figure 10.3.

**Figure 10.3**
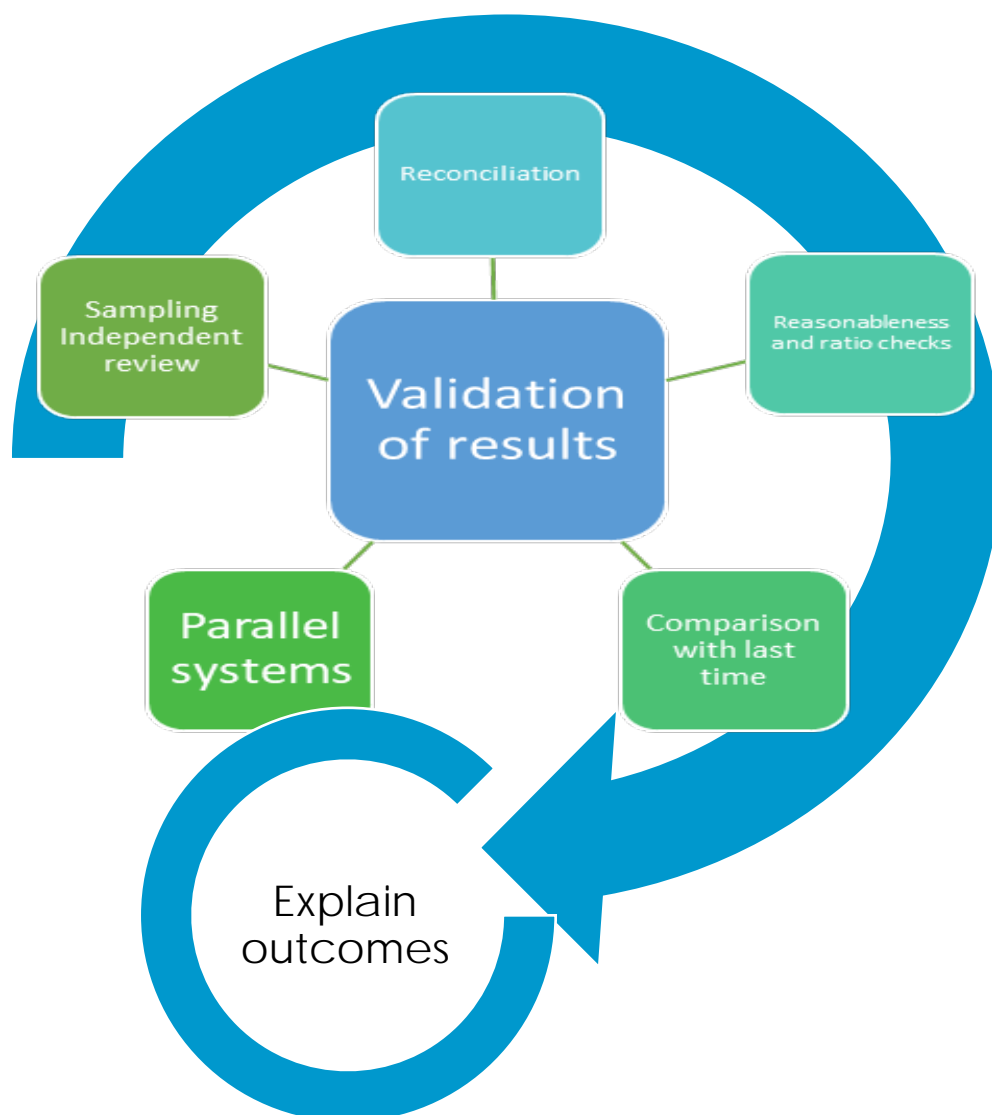
## 10.6.  Reporting results

### 10.6.1. The nature and purpose of reports

The results of valuations will be communicated in various types of reports. The content and style of the report will depend on its purpose and intended users. A report may be prepared for multiple purposes and for multiple audiences. For instance, a life company report may be intended for management, analysts, policy owners and/or the regulator. A retirement fund report may be intended for members, trustees and/or the employer sponsor.

A report is likely to constitute formal, written actuarial advice and needs to be prepared in accordance with any relevant professional standards. Reports prepared for statutory purposes need to comply with relevant prudential, accounting and auditing standards.

### 10.6.2.  Content of reports

It is important that the key matters, messages and information are given appropriate prominence in a report.

The following are some key components that should be included in a valuation report.

### Purpose

A report should state the purpose for which it has been prepared and its intended audience. In preparing a report, an actuary should consider and document the capacity in which they are acting. While the actuary may be commissioned by a life company or retirement fund, the actuary may also have a duty under relevant laws and standards to protect the interests of policy-owners or members. Any limitations in how the report should be used need to be clearly articulated.

## Results

Results should be summarised at an appropriate level. The level of detail to be provided in actuarial reporting will depend on the size and complexity of the business or fund and the materiality of a portfolio or item.

Insights drawn from the interpretation of results and their impact or significance to the business or fund are essential. Valuation results may have implications for profit distributions, capital requirements, DB funding requirements and so on. Any recommendations or actions arising from the valuation should be clearly stated.

Often, the presentation and analysis of emerging trends, including comparison with previous results, is as important as the actual results. Analysis of the emerging profits or surplus provides validation of results and insights into key matters affecting the company or fund. The impacts of any changes in assumptions made since the previous valuation and the reasons for those changes should be addressed. Graphs and diagrams, such as the waterfall example shown in Figure 10.4, are often valuable in presenting more complex trends and relationships.

**Figure 10.4: Sample waterfall presentation of results**



Change in Liability – 2018 v 2017

It is important to document the material risks reflected in policy, benefit and other liabilities, discuss the principal means by which those risks are managed, and describe how this is reflected in the valuation.

## Sensitivity testing

The financial significance of the important assumptions or methodologies used should be communicated by illustrating the sensitivity of the results to changes in the key assumptions.

## Reliance and limitations

A report should describe the steps taken to establish the accuracy of the results. Reference should be made to other documents, if any, that have been relied upon. Where reliance is made on any matter, or work is undertaken by another person or party, this should be made clear.

If there are any known limitations or shortcomings, such as those arising from the approach taken, adequacy of data used or any other matter, these should be documented and explained.

Not all reports will be full, formal documents. However, a report should, at a minimum, include references to relevant supporting documents or files.

## Valuation methods and assumptions

In some cases, a separate technical report may be used to document details of the valuation method, model and basis, as well as the approaches used to validate the results. A summary of the methods and assumptions used should still be included in the main valuation report, which should demonstrate how all material, relevant matters have been addressed.

The language should be clear and not open to misinterpretation by the target audience. The actuary should be aware of the range of interpretations that may apply to terms used in the report, such as *claims ratios* or *discontinuance rates*. Where it is necessary to use technical terms, they should be explained.

A separate technical report is likely to be for internal actuarial usage but may be used in audit or independent actuarial reviews. The report may also be utilised in preparing more technical disclosures for statutory reports.

A technical report may assume that the user has an actuarial background and make greater use of technical terms. Some terms, however, may still be open to different interpretations, depending on an actuary's background. For example, as mentioned in Module 5 (Life valuation), some actuaries may refer to the *actuarial basis* as being inclusive of methodology, whereas others will use the term *basis* exclusively in relation to valuation assumptions. The actuarial profession is international, making it especially important to exercise care in the use of terminology, even in a technical report.

The report should include a description of the calculation methodologies adopted for each type of policy. This will include the treatment of liability options or guarantees, claims run-off management, expense risks and risks associated with other experience items. The report will also document the valuation assumptions adopted for each type of policy.

The items that may need to be addressed in an insurance valuation include:

- premium rates and charges for existing and new business;
- the nature, terms and conditions of policies, their options, guarantees (including investment guarantees) and the scope for adjusting the terms and conditions;
- existing investments, including the continuing or any proposed investment policy;
- reinsurance arrangements;
- apportionment of relevant income and outgoings between different classes of business and between participating and non-participating policies;
- reinsurance arrangements;
- the implications for the way that unit pricing is conducted;
- treatment of taxes;
- the current and a range of plausible future experience in respect of mortality and other risk elements;
- the current and a range of plausible future experience in respect of lapse and surrender rates;

- data sources and an opinion on data reliability;
- any operational or system issues that impact the valuation, its reliability or recommendations arising from the valuation; and
- how products were grouped for the purposes of valuation and reporting, including the distinction between *participating* and *non-participating*.

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**Exercise 10.2**

The terms *material risks* and *material matters* are used in the discussion in this section on reporting and documentation. How would you define a "material" matter?

Against what items or values might you assess materiality and why?

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## 10.6.3. Level of aggregation for reporting

Whilst every policy needs to be valued, grouping of like policies is required when reporting results. The extent to which policies are aggregated for the reporting of results is a key consideration when conducting a liability valuation. Some results, such as profit margins, may be determined and applied only at an aggregate level.

Policy groupings are likely to be guided or may be prescribed by relevant standards. A range of alternative approaches to aggregation may be acceptable under a regulatory standard. Where this is the case, it would be important for the company to justify the approach taken and to apply the approach consistently in successive periods. Generally, grouping or aggregation is based on policies with similar characteristics. New policy series may be grouped with existing series with similar characteristics.

Liability valuations and profit margins are meaningful in the context of a group of similar policies. Costs are allocated to broad product groupings and other assumptions, such as claims rates, are based on the average experience across portfolios of policies.

While systems may project cash flows separately for individual policies or benefits, items such as liability margins, bonus rates and certain provisions are generally calculated only at the policy group level.

It is important to recognise that the level of aggregation can affect the end result. For example, an aggregated group may include a large, very profitable series and a small, loss making series. If the two were treated separately, provisions for expected future losses would be required in the liability valuation for the smaller series. However, the combined group may be profitable, so no future loss provisions would be required for the smaller series.

Records of accumulated provisions for expected losses or profit margins for adjustment of liabilities may only need to be maintained at a (aggregated) product group level.

The level of grouping can be different for other purposes, say, internal reporting. For example, it may be reasonable to group similar series of products for statutory reporting purposes, but a more granular approach may be more appropriate for identifying pricing or profitability issues and driving business decisions. If reporting at more granular levels internally, it is important to explain differences; for instance, to explain whether differences reflect pricing or expected claims, or whether they are driven by more subjective allocations of costs between subgroups.

## 10.6.4. Additional considerations for a DB retirement fund

Many of the principles and issues discussed in 10.6.2 and 10.6.3 apply equally to reporting on valuations for DB retirement funds. Additional items that may need to be addressed in a DB valuation report include:

- the funding method adopted and the reasons for adopting it;
- the different categories of members in the fund, such as:
  - current executive members;
  - current staff members;
  - members with deferred benefits who are no longer employed;
  - pensioners;
  - members eligible to retire at any stage but not yet retired;
- the method of determining future salary or pension increases;
- the methods used to determine past and future service entitlements; and

- the methods used to determine the value of future benefits accrued from past service and vested member benefit entitlements

The employer funding rate is the key recommendation for a DB fund valuation prepared for the trustee. It may be valuable to provide information on expected future changes to this rate, how the rate compares to past rates, and the reasons for change. Module 14 (Capital) on risk-based capital suggests methods for examining potential changes to the employer contribution rate. It is also useful to indicate the likely cash flow requirements of the fund in the next few years.

Where assurances are given or matters are raised by the trustee or the sponsoring employer, these should be verified and documented.

| **Exercise 10.3** |
| --- |
| List examples of assurances that may be provided by the sponsoring employer. <br><br> List examples of matters that may be raised by the trustee. |

## 10.7. Key learning points

- The liability valuation process forms part of a wider cycle of financial reporting and disclosure across the company or fund.

- Good project planning includes valuation process flow documentation and a project plan with key steps, roles, stakeholders and timeframes identified.

- Company or fund reporting activities tend to be managed within very tight timeframes. Resourcing will be strained during this period.

- The selection of a completely new valuation system will be infrequent. However, existing valuation systems and models may need to be modified to incorporate changes to the running environment, business or reporting requirements.

- Valuation models may be built in spreadsheets or proprietary projection systems.

- Models may be used for a variety of purposes and regular consistency checks between models need to occur.

- Valuation data is obtained from a variety of sources, including a company or fund's policy or member administration systems, claims databases and external data.

- Strong data quality control processes are important to the integrity of the valuation. If the quality of data is poor, the actuary may recommend additional liability margins to compensate.

- The extent to which data and results should be grouped depends on, amongst other things, the purpose of the valuation, the product(s) being valued, the quality of data and the reporting requirements.

- Validation and explanation of results are critical, and generally include comparisons with previous results, explanation of changes in surplus or profit arising, and analyses of emerging trends.

- The content and style of a report will depend on its purpose and intended users.

## 10.8. Answers to exercises

### Exercise 10.1:

There are other business issues where judgement is required and the treatment at the reporting date can materially affect the results. For example, a sizable reinsurance recovery may be under negotiation where dispute exists as to the reinsurer's liability. Consider how this would affect the results. What would happen if the issue was settled after the valuation date but before the release of the results?

Answer:

For reporting, a decision needs to be taken about the likelihood of the issue being settled favourably and, depending on the dispute, the amount of recovery likely to be received.

The value of any expected recovery would require judgement. This is not an issue that can be calculated statistically based on similar situations in the past. Legal and other professional opinions may need to be sought

If the issue is settled after the date of valuation, it may be possible to reflect the known outcome in the results. Reporting standards may provide guidance and would likely be based on the materiality of the issue. There may be a period of time where it would be difficult make changes. Market disclosure may be required. Such disclosure is only likely to be required if the settlement materially impacts results.

### Exercise 10.2:

The terms material risks and material matters are used in the discussion in this section on reporting and documentation. How would you define a "material" matter?

Against what items or values might you assess materiality and why?

Answer:

The concept of a matter being material is subjective and can depend on the context or situation. The principle underlying materiality is that values or information are material when their misstatement or omission would cause the actuarial report to mislead its users when they make evaluations or decisions.

Legislative or professional standards may stipulate or provide guidance on materiality. The International Actuarial Association suggests that variations in amounts of at least 10% of the appropriate base amount may be material and, if less than 5%, may be immaterial.

Judgement against the above principle is usually required, particularly for variations between 5% and 10%. These variations are to be cumulative across the whole policy liability. The base amount in respect of components of profit statements is the operating result (net of tax profit or change in surplus). In respect of balance sheets, it is the lesser of (i) the difference between the assets and policy liabilities, and (ii) the appropriate policy liability class total.

## Exercise 10.3:

List examples of assurances that may be provided by the sponsoring employer.

List examples of matters that may be raised by the trustee.

Answer:

Some potential employer assurances

- Assurance as to accuracy of member data and salary promotional scales provided
- Commitment to contribute at the recommended rate
- Commitment to contribute additional amounts to settle any funding shortfall within an agreed period
- Commitment to fund specific benefit payments arising in the future or an ex-gratia payment granted to a particular employee
- Commitment to meet certain fund expenses or provide services to support the operation of the fund
- Commitment to ongoing support of the fund

Some potential matters raised by the trustee

- Concern over accuracy of fund data
- Level of surplus arising in the fund and the entitlements of different classes of member and the sponsoring employer in relation to the surplus

- Concern over shortfalls in the level of funding or the sponsoring employer's ability to meet commitments
- Where a funding shortfall exists, the trustee may be concerned about equity between different classes of member and the impact of benefit payments on the security of continuing members
- Concerns over insurance arrangements or the suitability of an insurer
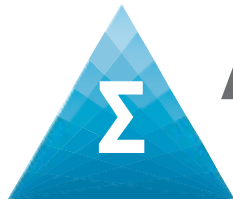
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