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Expert judgement

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Abstract

Expert judgement has been used since the actuarial profession was founded. In the past, there has often been a lack of transparency regarding the use of expert judgement, even though those judgements could have a very significant impact on the outputs of calculations and the decisions made by organisations. The lack of transparency has a number of dimensions, including the nature of the underlying judgements, as well as the process used to derive those judgements. This paper aims to provide a practical framework regarding expert judgement processes, and how those processes may be validated. It includes a worked example illustrating how the process could be used for setting a particular assumption. It concludes with some suggested tools for use within expert judgement. Although primarily focussed on the insurance sector, the proposed process framework could be applied more widely without the need for significant changes.

Keywords

Expert Judgement; Solvency II; Materiality; Process; Validation

1. Introduction

1.1. Executive Summary

Solvency II is a key driver of change within the prudential regulation of insurers – the difficulties around developing appropriate and proportionate practical solutions to the various challenges this regime change presents are well known, and common approaches/themes have emerged within the industry for several of the key problem areas. One area within the industry over which there appears little consensus is on the approach to expert judgement. The wide coverage of the application of Solvency II principles to how insurers run their businesses means the associated expert judgements are also of considerable breadth and depth (covering such areas as best estimate assumptions, stresses, aggregation, the loss absorbency of deferred tax and other adjustments), and the expert judgement requirements and guidelines set out in the Solvency II texts have proved a difficult concept for many insurance companies to tackle.

This paper aims to provide some clarity of thinking on expert judgement and practical suggestions on how companies could tackle this difficult concept.

Key to ensuring expert judgement is managed appropriately within the business is ensuring a robust, clear and consistent approach to decision making is in place. This should involve embedding an

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expert judgement framework, including the creation of an expert judgement policy, governance structure, standards, expert judgement process and validation structures. In this paper, we focus on the areas we believe are the most challenging – process and validation.

The expert judgement process is focussed on discussing uncertainty and understanding the impacts across the business and we believe it useful to introduce some additional concepts to help facilitate a robust discussion.

Plausible range: this provides an understanding of the diversity of potential (but plausible) views/judgements by settings out a quantitative or qualitative range of potential judgements.

Uncertainty total impact: commonly, the decision and ensuing outcome that matters will depend on a series of interacting expert judgements – aggregating the impacts on the output metrics across all expert judgements (considering their plausible ranges) will give a sense of the variability of the model output metrics as a result of uncertainty around expert judgements.

Uncertainty reduction budget: we consider it helpful to have a way of setting the desirability of reducing the uncertainty total impact over time. This will allow a business to assess the relative benefits of allocating resources/budget/spend in a particular expert judgement area.

We propose an expert judgement process that is split into five stages:

i. *Preliminary assessment of judgement*: this involves clarifying the nature of the judgement and assessing whether it falls within the scope of the EJ process (e.g. material enough).
ii. *Defining the problem*: a clear articulation of the problem, scope of its application and current understanding is required to set an expert brief, and decisions on potential experts, initial plausible range, drivers for change ensure the scope and scale of the judgement are well understood at the outset.
iii. *Elicitation of expertise*: the approach taken to elicit the expert views will depend on the nature and importance of the particular expert judgement, and on the conditions required to manage areas of bias. Clarity is required on the data, assumptions, principles, methodologies and models applied in arriving at a recommendation and on any potential limitations – this will allow the initial plausible range and uncertainty total impact to be re-assessed.
iv. *Decision making*: the governance around the consideration of any recommendation, including ensuring appropriate scrutiny and challenge, setting out the thought process of the decision makers, etc. is important to ensure decisions can be validated and re-assessed in light of new information.
v. *Ongoing monitoring*: decisions are often made at a point in time within an ever-changing environment, so ensuring a robust system is in place to monitor the validity of a decision (materiality, scope of its application, appropriateness of assumptions) is crucial.

Although a cycle of re-examination of the evidence and self-critique by those who made the original judgements are important parts of a feedback loop, ensuring appropriate independent validation of expert judgement adds significant value and is in line with expectations of the wider Solvency II regulations. A core characteristic of the expert judgement process that we propose is that the thought processes behind decisions are clearly set out in a logical structure covering the information sources used, the relative importance attached to each information source and rationale and how those information sources are used to form the decision. This structure facilitates the validation process, with each step in the decision-making process being clear and open to challenge from the validators.

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The validation tools proposed for Solvency II internal models provide a useful structure for validating expert judgements made by actuaries in a wider context – these validation tools include back-testing, stress and scenario testing, benchmarking, profit and loss attribution and simplified models/assessments.

Managing an expert judgement framework will require a number of practical elements to be in place, in addition to the embedding areas highlighted earlier. Guidelines and documentation standards will ensure consistency of expert judgement process and documentation, whereas an expert judgement register allows expert judgements to be tracked and monitored (review triggers, expiry dates, application areas) and can allow judgement consistency to be assessed (e.g. by common drivers) and also provide a coordinated audit trail for evidencing the decision-making process.

It should be noted that although this paper focusses on the principles of expert judgement within the Solvency II framework, the principles and suggestions set out in this paper can be considered more widely. Ensuring suitability of and confidence in important decisions made in business/scientific/social settings is critical whatever the setting. The decision-making process is ultimately driven by an individual's judgement that will be driven by their knowledge, environment, beliefs and emotions – we believe that any structure/validation put around this can only enhance the wider understanding of the appropriateness of any judgement being made.

1.2. Background

1.2.1. The Solvency & Capital Management Working Party in recent years has focussed its efforts on considering some of the more practical aspects companies face under Solvency II, producing a well-received SIAS paper in 2009 on the implications/challenges of the internal model tests, as well as several Life Conference talks over the last few years on Solvency II transitional arrangements, materiality and expert judgement.

1.2.2. The challenges around Solvency II are numerous, but a common theme emerged within the Group on a practical area for which limited guidance was available and which we could see the industry as a whole was struggling with – the topic of expert judgement. This paper aims to provide some clarity of thinking on expert judgement and practical suggestions on how companies could tackle this amorphous concept.

As part of the research performed in writing this paper, we performed a survey at the start of our work and have more recently had several discussions with the owners of the expert judgement frameworks in a number of insurance organisations. Insights from these investigations have been used to inform our thinking when developing our proposed process.

The following sections aim to provide some context on the perceptions around expert judgement, the history of it in the profession and how the current requirements have emerged.

1.3. Expertise

1.3.1. Being required to evidence expertise in decisions, which would have a material impact on a particular outcome, is clearly not a new concept that Solvency II has created.

Professions and expert bodies were created to provide a forum for like-minded specialists in a specific field to gather, to ensure minimum standards were set and to uphold and promote the reputation of

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those working in that field. The fact that most professions have study and examination requirements along with continuing professional development requirements and professional conduct standards shows a common theme of being able to evidence appropriate understanding and skills of those with the particular professional designation.

1.3.2. The importance of expert judgement has been recognised by other working parties; for example, the Extreme Events Working Party in their recent Difficult Risk and Capital Models paper (Frankland *et al.*, 2013) commented:

- any model will necessarily require some degree of expert judgement;
- expert judgement and data-driven assumptions are not mutually exclusive concepts; and
- capital models contain big inherent risks that are often ignored, for example, model risk, what risks to model, etc. and so understanding the expert judgement that arrived at the current modelling approach can be critical to getting comfort on the approach taken.

1.4. Materiality and proportionality

1.4.1. The process and validation proposed in this paper should be seen as a "model answer" for dealing with expert judgement within the framework. Key to this process is the consideration of a proportionate application of the suggested approach given the materiality of the judgements being considered. We trust that the regular highlighting of materiality and proportionality throughout this paper emphasises the fact that appropriate tailoring of the process will be required depending on the firm and the nature of the particular expert judgement.

1.5. What Is An Expert?

1.5.1. The expectations around what makes an expert will vary by the purpose of the expertise required, so we consider below three themes from a selection of sources to provide some context:

i. *Regulatory view*: As noted in appendix section 1.1, the Solvency II regulations state that expert judgement should be based on the expertise of persons with relevant knowledge, expertise and understanding of the risks.

ii. *Expressive view*: When asked to articulate how to identify and describe an expert, the general consensus from respondents to our survey (who themselves had some expertise in the area) was "you will know one when you see one".
And the importance of relevant expertise was set out vividly via a metaphor by one of our survey respondents as: "*if they were in hospital having a medical operation, it would be advantageous if the person operating had medical qualifications and relevant experience and was not just a layman turning up to 'have a go*!'"

iii. *Holistic view*: The Wikipedia definition sets out a good "holistic" view of the key characteristics that make up an expert:
"*An expert is someone widely recognized as a reliable source of technique or skill whose faculty for judging or deciding rightly, justly, or wisely is accorded authority and status by their peers or the public in a specific well-distinguished domain. An expert can be, by virtue of credential, training, education, profession, publication or experience, believed to have special knowledge of a subject beyond that of the average person, sufficient that others may officially (and legally) rely upon the individual's opinion*".

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1.6. Expert Judgement Thinking

1.6.1. Our proposed approach to developing and using expert judgement is based on a number of key ideas borrowed from a variety of other disciplines. We describe two in particular below.

1.6.2. Scientific approach/critical thinking

We propose to consider expert judgements made as hypotheses, which may be falsified by further information. Related to this are the disciplines and skills of critical thinking that push those asking the questions to provide a clear purpose and implications for the advice and for experts to articulate the bases for their judgements and the underlying data, information, evidence, concepts, ideas and interpretations that underlie their view. Our work is not intended to make expert judgements easy. Indeed, we are proposing a potentially more challenging way of working that requires effort and perseverance. However, we believe that the benefits to the organisation both in terms of justifying the assumptions made and understanding the linkages between the organisation and its environment to be worthwhile. For those interested in learning more about critical analysis, the authors direct you to the following website: http://www.criticalthinking.org/pages/the-national-council-for-excellence-in-critical-thinking/406

1.6.3. Group learning

Within the wider academic discussions on expert judgement, one area of common contention is a view by some that expert judgements can only be made by individuals. In the context of the actuarial work covered in this paper, these judgements clearly need to be owned by organisations. There are particular challenges that we seek to address to avoid any contradiction:

- Each of the experts needs to be able to explain the basis for their judgement in terms in which their peers can understand.
- The collection of experts needs to be able to work together in a group in order to come to a combined decision.
- The judgements made will be re-assessed as part of a regular cycle of actuarial work and therefore need to be recorded in a form that a (potentially different) set of experts can use as a base for their future work.

Underlying our proposals is the concept that knowledge is "constructed" by arranging experience so that it makes sense to individuals. A common judgement can therefore arise through active and constructive social mediation of experiences and ideas. Our processes and templates are designed to facilitate the pooling of experience and ideas through "guided practice" to work steadily and surely towards a decision, sometimes in the absence of consensus.

We also believe that there is value in the annual cycle of dialogue, recording, reflecting and gathering experience within an actuarial team in improving "group knowledge". For those that are interested in learning more in this area then the authors recommend the study by Nonaka & Takeuchi (1995).

1.7. Focus for Expert Judgement in Actuarial Work

1.7.1. We will explore in more detail the areas of actuarial expert judgement, but to provide some initial context for the reader we set out below a variety of reasons for which we believe that there is a need for clear expert judgement standards and evidencing in the actuarial environment:

- To ensure the material risks to the balance sheets from judgements made are well understood.
- To set out a common understanding of the main areas for judgement such as:

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a. assumptions;
b. aggregation methodology;
c. individual risk modelling methodology; and
d. approximations.

- To understand the limitations/scope of any judgements being made.
- To ensure appropriate evidencing of expert's thought processes and credentials.
- To understand the sensitivity and risk inherent in judgements.
- To facilitate appropriate governance, debate and challenge around key areas.
- To ensure appropriate documentation and communication.
- To ensure appropriate visibility across all stakeholders.
- To ensure appropriate audit trail for decisions.
- To facilitate common process to allow comparison of related judgements.
- To ensure consistency of decisions across the business.
- To allow for comparison of judgements across the industry (easier benchmarking, etc.) where it is appropriate to compare methodologies.

1.8. Evolution of Expert Judgement in the Actuarial Profession

1.8.1. Providing and documenting evidence and reasoned argument within insurance is nothing new. The need to have a methodology to quantify the value of liabilities has been around since the 18th century, and practising of actuarial science has always required judgement in setting assumptions and choosing modelling methods.

1.8.2. There are a variety of events in the history of the profession that can be recognised as highlighting the requirements to demonstrate, document and support the core expert judgement ability of members (we focus below on the UK professional bodies, but similar changes/requirements are common across the globe) – a few are listed below:

- As set out in section 1.3, creation of professional bodies is a key element in providing an environment in which expertise can thrive and be supported – the Institute of Actuaries was founded in 1850, and the Faculty of Actuaries was set up a few years later in 1856. To ensure members were able to meet appropriate standards, the Institute setup an examination framework in 1852.
- Professional guidance standards continued to evolve in the following century and the need for actuarial expertise in a specified role was introduced by an act of parliament in 1973 that created the role of the Appointed Actuary.
- The fallout from the Equitable Life ruling in 2000 led to significant changes in the profession's requirements and standards:
  - The recommendations in the ensuing Penrose report led to the replacement of the appointed actuary role with two specialist (expert) roles – the Actuarial Function holder and the with-profits actuary (for firms with with-profits business) from 31 December 2004.
  - The Morris review (final report issued in March 2005) led to significant changes in the standard setting, ongoing education within the profession and establishment of the Technical Actuarial Standards (TAS) requirements to support actuarial decisions in order to ensure confidence in the expertise of the profession was maintained.

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1.8.3. The complexity of the risk-based balance sheet (as per Solvency II) and the expertise required to develop, review, validate and explain the outcomes, and also more importantly to understand and manage the risks that it highlights requires a wide variety of expertise to be brought together. Thus, creating a framework where the expert judgements made in this environment can meet appropriate standards and be monitored and maintained in a consistent and proportionate way is critical. The governance principles and standards being set under the Solvency II regulations aim to provide such a framework.

This paper is set in the context of these new regulations and aims to provide some useful insights in how the requirements could be met in a pragmatic and proportionate way. Further detail on the Solvency II regulations follows in appendix section 1 – the detail in this section (especially in Level 3 Guidance) highlights how comprehensive the regulators expectations are on evidencing of expert judgement.

1.9. Expert Judgement Framework

1.9.1. The focus of this paper is the expert judgement process and validation, but this process needs to be embedded within the business through an expert judgement framework. As per any robust framework, this will require certain key elements:

- expert judgement policy;
- Governance structure (including clarity of responsibilities);
- links with associated policies (e.g. materiality/proportionality);
- clear documentation and standards;
- strong process;
- appropriate validation;
- systems (supporting tools, etc.);
- data (including management information).

1.9.2. Some of these are touched on further in later sections, but our discussions within the industry have highlighted that the process and validation areas are those that the companies are finding the most challenging, so this is where we have concentrated our effort.

1.10. Our Approach to the Emerging Solvency II Expert Judgement Requirements

This paper sets out what we believe is a pragmatic approach to meeting the emerging Solvency II expert judgement requirements. The structure of the paper is as follows:

i. key areas of expert judgement for companies to consider (section 2);
ii. a summary of the current key regulatory guidance (as at 31 December 2014) on this topic (appendix section 1);
iii. a proposal for a potential expert judgement process for companies to use (section 3);
iv. a practical example of how the process would work (section 4);
v. considerations on how expert judgement could be appropriately validated (section 5); and
vi. a summary of some sample tools that could be used (section 6).

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2. Particular Areas of Expert Judgement

2.1. Context

2.1.1. In this section we outline the areas of expert judgement as they apply to the best estimate assumptions, stresses, aggregation, the loss absorbency of deferred tax and other adjustments. It is important to note that the judgements applied when setting the best estimate assumptions are highly material, not just in the determination of the best estimate liabilities, but as the basis upon which the stresses are calculated.

2.1.2. The first section outlines the challenges for the expert judgements applied when calculating the best estimate assumptions, the second section discusses the general challenges that affect stresses and aggregation judgements and the third section covers the justification of the loss absorbency of deferred tax.

2.2. Best Estimate

Best estimate assumptions are typically set through an experience analysis process (for demographic assumptions) and through the use of data analysis (for market assumptions). Where appropriate, this will be adjusted for views of future demographic or behavioural changes (for example mortality trend improvements) or expected changes in market conditions (e.g. increased future market volatility relative to that implied by historical data).

2.2.1. Data and data manipulation

2.2.1.1. Data, both internal and external, forms the basis of the best estimate assumptions. All data are limited, and for some assumptions there may be significant issues in obtaining sufficient relevant data. Nevertheless, where data exists, it is expected by the regulator that this will be taken into account in some way. There are a number of challenges relating to this data that necessitate the use of expert judgement. Some of these relate to the choice of data itself, and some to the way in which the data is used in order to set assumptions.

i. *Choice of data set (internal)*: internal data are typically applied, in conjunction with external data, during the setting of demographic assumptions. Experts need to consider:

    a. The extent to which internal data can be considered reliable and robust – for example, are any errors and limitations that apply to internal data acceptable and is there a sufficient volume of data at an appropriately granular level?

    b. The extent to which internal data can be considered relevant – for example, changes to the structure or terms of a product over time may result in historical data for this product having limited relevance. An example of this would be historical lapse experience where surrender charges have been removed.

    c. Over what historical period should data be considered? There is a trade-off here between the desirability of using more data and the potential lack of relevance of data from a distant time period. For example, lapse experience is likely to change over time owing to changes in consumer behaviour, media coverage, changes in taxation treatment of alternative investments, etc.

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d. Similarly, should data be weighted according to its relative recency? In addition, does the data reflect "one-off" events such as a change of company ownership and should this effect be smoothed/removed?

ii. *Choice of data set (external)*: External data are often used to adjust internal data results or, in the case of market assumptions or for demographic assumptions where insufficient internal data exists, used alone to set assumptions. Experts need to consider:

a. The extent to which external data can be considered reliable and robust – this is generally straightforward for some data sets (e.g. CMIB, FTSE), but may be less clear cut for other external data such as surveys.

b. The appropriateness of the external data set to the assumptions being modelled. For example, in order to reflect an individual company's current equity holdings, is a single index appropriate or should a weighted mix of equity data sets be modelled? Which specific index/indices are most appropriate? For some indices (e.g. FTSE 100), the assets forming the index are clear. However, this may be more opaque for other indices (e.g. some property indices).

c. The use of proxy data sets where insufficient external (or internal) data exists. For example, in recent years, alternative assets such as infrastructure bonds have become popular amongst insurance companies, but little historical data exist on their performance.

d. Similar to internal data, there are considerations about the length of the historical period used, and any weighting applied.

e. Regardless of the external datasets chosen, there is likely to be residual basis difference as the indices are unlikely to exactly replicate a company's holdings at all points in time.

f. The extent to which any outliers should be removed from the data. A small number of outliers could have a significant impact on, for example, a calibration outcome, which may not be considered appropriate. Conversely, removal of outliers may result in a thinner-tailed dataset than is appropriate.

2.2.2. Adjustments to data set analysis

2.2.2.1 Adjustments, involving the use of expert judgement, may be made to the results of the initial data analysis for a number of reasons. For example:

i. To allow for estimated future changes in experience (e.g. risk discount rate impact on persistency and medical advances on mortality/morbidity/longevity risks).

ii. To reflect differences between the data and the specific nature of the company's assets and liabilities. For example, adjustments may be made to external mortality tables to allow for the different geographical or social features of a company's policyholders.

iii. To allow for known limitations of the data. For example, survivorship bias is inherent in many indices where failing companies are removed from the indices and replaced. Using indices without adjusting for this may underestimate volatility and price movements. Margins may be added where there is a lack of sufficiently credible data.

iv. Estimating the impact of the changing nature of the current existing business as it runs off. Different cohorts of business may exhibit differing propensities to lapse, for example, with-profits policies with valuable guarantees may be "stickier" than otherwise similar unit-linked policies.

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v. Removal or reduction of the impact from "one-off" events that are reflected in the historical data (e.g. unusual persistency experience following a company merger or demutualisation).

vi. Manipulation of the data (e.g. the use of overlapping time periods to increase the size of the data set).

2.2.3. Approximations

2.2.3.1. Approximations are often made during the assumption-setting process. For example, some smaller lines of business may be modelled using the same assumptions as larger lines, without performing a separate experience analysis. The use (and determination of the appropriateness) of an approximation is an expert judgement. In particular, experts must satisfy themselves that the use of such an approximation does not lead to material differences in the results.

2.3. Stress and Aggregation

2.3.0.1. The calibration of stresses and the correlation assumptions allowed for during the aggregation process typically involve significant amounts of expert judgement. This is largely due to the lack of relevant historical data, not just for extreme events individually but for their joint behaviour.

2.3.1. General methodology

2.3.1.1. The setting of the methodology for the calibration of stresses and their aggregation will involve considering a number of options. The choice of methodology therefore involves expert judgement, including (but not limited to) the following key considerations:

i. Whether to calibrate stresses using 1-year Value at Risk (VaR) or another measure (e.g. run off) that is considered to be more appropriate and no less prudent.

ii. Which stresses to model separately. For example:

    a. credit spread stress may be separated into further sub-stresses such as spread movements, transitions between rating classes, etc.; and

    b. longevity stress may be separated into trend stress, base stress, etc.

iii. The level of granularity at which stresses are determined. For example:

    a. equity stress may be separated by currency or broad investment market (e.g. Europe, United States, Asia, emerging markets, etc.) or by industry (e.g. financials/non-financials) or in some other way appropriate to the company's holdings; and

    b. lapse stress could vary by product type, country or year of entry.

iv. The level at which aggregation is applied. For example, consider a company that has split operational, longevity and credit stresses into a number of sub-stresses. There is a choice to be made about the level at which aggregation is applied. Are these sub-stresses then aggregated to give an overall stress for operational risk (similarly for longevity and credit) before then being aggregated with all other stresses? Or is the aggregation performed in one step allowing for the correlations between all sub-stresses with all other stresses (and sub-stresses) in the model?

2.3.2. Stress calibration

2.3.2.1. Stresses are typically calibrated to a 1-year VaR using a chosen probability distribution function. This gives the likelihood of a particular stress occurring with a particular magnitude

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(e.g. there is a probability of x% that equity markets will fall by y% over the next year). Key areas of expert judgement for calibrating both economic and non-economic risks are:

i. The choice of probability distribution to fit data to. There are often a variety of valid distributions that could be used. A trade-off may be needed between the achievement of a good fit to historical data and practicality of use within the internal model. In reality, a number of different distributions may display adequate goodness of fit, with the ultimate choice requiring further expert judgement.
ii. The choice of method used to fit the data to the chosen distribution – for example, maximum likelihood/method of moments.
iii. The application of any adjustments to the distribution – for example, to allow for a lack of data in the tails of the distribution, to reduce the impact from significant single outliers in the data points or to allow for other known limitations in the data.

2.3.3. Aggregation

2.3.3.1. There are a number of issues with historical correlation data – for example, correlations changing, even flipping sign, over time and very little useful data giving correlations between demographic risks and other risks. In particular there are a limited number of stress events, and the correlations between the risks considered in an internal model are not always evident during these events (e.g. the data from the credit crunch gives us little information on the correlations between credit spreads and longevity).

2.3.3.2. The choice of aggregation method is also likely to have a significant impact on results, for example, the choice of copula to use.

2.3.3.3. Expert judgement is therefore applied widely during this stage of the modelling. As the assumed correlations are likely to be highly material to the solvency capital requirement (SCR) results, a robust, well-documented process is essential in order to justify the assumptions made.

2.4. Loss Absorbency of Deferred Tax

2.4.1. The Solvency II regulations allow for a reduction in the SCR for the loss absorbency of deferred tax. This can be owing to a reduction in the base balance sheet deferred tax liability and/or the creation of, or increase to, a deferred tax asset. Reducing the deferred tax liability is straightforward but, in order to increase/create a deferred tax asset, justification of sufficient future profits following a 1-in-200 year event will be required.

2.4.2. Expert judgement is likely to be required in order to project these future profits. For example, assumptions will be required for the following, after a 1-in-200 year event:

a. The quantity and type of new business the company will be able to sell.
b. Whether the company will be able to recapitalise if necessary, to what extent this may be done and the cost of doing so.
c. The profitability of the existing and new business.
d. The release of other margins.

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2.5. Management actions

2.5.1. Assumptions may also be required about the management actions that will be taken in the future. For the best estimate, management actions may have been codified within the realistic balance sheet models and represent an accepted view of what is consistent with "normal practice" for the with-profits fund. Potentially this could be extended to other types of business. Firms may also choose to make assumptions on the actions they would take during and/or following a change in financial conditions to mitigate losses for the purpose of the capital model. Expert judgement may be required to extrapolate historical action (if any) of those used in extreme circumstances.

3. Expert Judgement Process

3.1. Context

3.1.1. Judgement is inherent in all models, as a model is effectively a simplified representation of reality. Some of those judgements will have a small impact on the model results, others could potentially have a significant impact (including the uses to which the model is put).

3.1.2. We believe that it is very important for a firm to have an Expert Judgement Policy. We provide more detail on this in section (REF) but one of the key aspects of this policy would be to define when a judgement should be treated as an expert judgement. The definition should try to ensure that all judgements which could have a potentially material impact on the model results are captured. Judgements which meet the definition of expert judgements should be subjected to appropriate processes to ensure that suitable rigour is applied to the decision. This rigour would cover aspects such as:

- the approach to forming the judgement;
- how it is documented;
- how it is validated; and
- how it is monitored.

This section primarily looks at the first of these aspects: the approach to forming the judgement.

3.1.3. Expert judgements encompass a wide range of areas, but generally fall into one of three categories:

i. methodology;
ii. assumptions (including parameters); and
iii. Approximations.

In terms of assumption setting, some people may think of expert judgement as being mutually exclusive from data analysis and, in particular, that expert judgement will only be required when data are sparse or of poor quality. In practice, it is likely that decisions will encompass both judgement and data, with data feeding into the expert judgement process to inform both the views of the experts and the decision makers so that a judgement can be reached. That said, more weight will be given to the judgement when the data is lacking in quantity, quality or relevancy. The choice of the data to use could itself require an element of expert judgement.

3.1.4. In this paper, we focus our discussions in the context of expert judgement related to actuarial work, in particular to the valuation of assets and insurance liabilities, to assessments of capital

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adequacy, and to product pricing and profit testing. However, we believe that the concepts and processes that we propose would be relatively straightforward to transfer to other sectors and purposes.

3.1.5. At a high level, the expert judgement process can be thought of as consisting of:

i. identifying sources of information;
ii. using that information to inform the expert views; and
iii. decision makers taking those expert views and sources of information into account to reach a decision.

3.1.6. Given the wide range of aspects covered by expert judgement, the appropriate process for a particular judgement will depend on a number of factors including the materiality of the decision, the level of judgement required, the level of in-house expertise, the firm's decision-making governance, etc. For some expert judgements it will be appropriate to seek the views of external experts; for others, sufficient in-house expertise may exist. For certain expert judgements, the experts may also be the decision makers (which can itself cause problems with the governance in terms of ensuring that robust challenge of alternative views have been considered). In addition, there may be a number of iterations through the process. The proposed process structure that we set out below is provided in the context that it will need to be modified to fit the firm and the specific expert judgement, but we hope that the concepts within it will be helpful in setting an appropriate process framework.

3.1.7. The process is split into the following key stages:

i. preliminary assessment of judgement;
ii. defining the problem;
iii. elicitation of expertise;
iv. decision making; and
v. ongoing monitoring.

The following section examines some concepts that may be useful in expert judgement work, and then the remainder of the section looks at each of the above stages in turn.

3.2. Useful Concepts

3.2.1. Expert judgement policy and framework

3.2.1.1. In much the same way that the firm will have policies on its various risks (e.g. market risk, credit risk, operational risk and so on), we believe that it is fundamentally important for the firm to develop an expert judgement policy. This will form the basis on which all expert judgement governance requirements sit and could cover aspects such as:

- what is meant by expert judgement;
- when the policy applies and limitations;
- interaction with any materiality, proportionality and validation policies;
- requirements of the management board in relation to expert judgement;
- requirements of executive and operational owners;
- documentation requirements;
- reporting requirements, including escalation;

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- requirements on the expert, including defining when an external expert needs to be sought;
- required review (both internal and external); and
- required frequency of refresh and review.

3.2.1.2. The expert judgement policy should link clearly to other policies, and the policies should be mutually compatible. Although this is important of all policies, it is particularly important that there is a clear link to, and fit with, the materiality, proportionality and validation policies. For example (and as discussed in section 5), expert judgement does not always lend itself to traditional validation methods.

3.2.1.3. The expert judgement policy should also link clearly to the firm's risk appetite. In particular, if the firm is able to define its tolerance to expert judgements – both at an aggregate level and at a more granular level (e.g. by main risk types) – then it will be better placed to understand the significance of its expert judgements. This is related to the concept of uncertainty total impact in section 3.2.3.

3.2.1.4. The expert judgement policy, along with the related policies for materiality, proportionality and validation, together with the expert judgement process form the expert judgement framework. We would envisage this framework sitting within the overall risk management framework of the firm.

3.2.2. Plausible range

3.2.2.1. A helpful concept in the context of expert judgement is that of a "plausible range". The idea is that any expert judgement should lie within a plausible range. By plausible range, we mean that a judgement which lies within the range would be considered plausible by: (1) a single expert using several ways of analysing the problem; and (2) by a range of experts.

3.2.2.2. We would envisage that the range of quantiles defining the plausible range would be set out in the expert judgement policy (e.g. it may be defined as the range between the lower and upper quartile). Each expert would then be asked to provide a range (e.g. the lower and upper quantile) around their central view of the item on which they are providing their advice. So, for example, the expert may be asked to give their best view of the 99.5th percentile 1-year stress, along with their assessment of the range around that point estimate. These views of the individual experts would then be combined into an overall central view and plausible range of expert judgement by the decision maker. The combined plausible range will provide an indication of the level of uncertainty around the decision, and be used to estimate the sensitivity of the model output metrics. A large plausible range around a particular item with significant impact may also indicate an area of the model which requires additional consideration and prioritisation around whether that plausible range may be reduced – we explore this further in section (REF).

3.2.2.3. Some experts who come from a non-statistical background may initially find the concept of expressing a lower and upper quantile around their central view as intellectually challenging. Cooke & Gossans (1999) suggest that this could be dealt with by providing some probability training to the relevant experts. Where this is not practical, we would suggest asking the experts to initially provide a minimum and maximum around their estimate, and then the person with responsibility for obtaining the expert judgement could attempt to establish during elicitation a plausible range consistent with the quantile range of interest.

3.2.2.4. We recognise that for certain expert judgements, especially those relating to methodology, this plausible range will be difficult to assess and also that the impact of the plausible range on the output metrics may also be challenging to compute in anything other than a broad brush manner.

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However, we believe that even in such circumstances (including where qualitative rather than quantitative assessments have been made), it does add value to think about expert judgements in this manner as it provides additional insights compared with the alternative of not having any such assessment. We will explore the practicalities of using plausible ranges later in the paper.

3.2.3. Uncertainty total impact

3.2.3.1. A model is likely to contain a number of expert judgements, each of which will have a plausible range, and the choices made within these plausible ranges will impact on the model output metrics of interest. "Impact" could be defined in a number of ways, for example:

i. The difference in the output metric at the upper end of the plausible range and the output metric at the lower end of the plausible range.
ii. The maximum of the difference in the output metric between the upper end and central view, and lower end and central view.

3.2.3.2. Irrespective of the definition used, aggregating the impacts on the output metrics across all expert judgements will give a sense of the variability of the model output metrics as a result of uncertainty around expert judgements. Although in theory there may be some degree of overlap between some of the judgements and thus their impacts, a simple summing of this total impact is likely to be helpful to consider. We describe this as the expert judgement uncertainty total impact, and it will be by reference to the particular output metric of interest.

The key purpose of this expert judgement uncertainty total impact measure is to give a sense of the variability of the model output metrics as a result of uncertainty around expert judgements. It is not suggesting that all of the expert judgements will be wrong to the maximum extent. This will require careful communication with senior management, regulators, auditors, etc. to ensure they understand the purpose of the assessment. The calculation of this impact helps to demonstrate that the firm has got a good understanding of the level of variability of the model outputs resulting from expert judgement, which also helps senior management to prioritise those areas of expert judgement which would most benefit from additional effort to reduce the variability around those judgements (where this is possible). We explore this further in appendix sections 1.5.7 and 1.5.8.

3.2.3.3. Although on the face of it this notion may jar with the Solvency II requirement for a single number for solvency capital at the 99.5% VaR level over 1 year, we believe that the concept brings an element of realism. This reflects the fact that while the aspiration is that the capital numbers are calibrated at this level of confidence, those outputs depend on many inherent expert judgements, which by definition are uncertain, and thus the capital calculated will have some degree of uncertainty around it.

3.2.4. Uncertainty reduction budget

Decision makers are likely to want to reduce the expert judgement uncertainty total impact over time. To be able to do so, they will need to allocate a budget. We refer to this budget as the uncertainty reduction budget. Such a budget should generally be spent in a manner which targets those expert judgements the plausible ranges for which have the largest impact on the model output metrics coupled with the greatest potential for being reduced. Other factors may also be relevant including the strategic aims of the firm. It should be noted that it may not be possible to reduce the plausible range around certain expert judgements, irrespective of the level of budget available, due to the inherent uncertainty in their nature.

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3.2.5. Region/area of the expert judgement

3.2.5.1. To facilitate the efficient allocation of the uncertainty reduction budget across the various aspects of expert judgement, we would suggest that the uncertainty reduction budget should first be allocated to a "region" of expert judgement, for example, "expenses", "longevity", "equity", etc. The uncertainty reduction budget within each "region" should then be allocated to more detailed areas such as "base table" and "improvement factors" within longevity risk, and then to specific elements such as "parameter A" or "modelling approach B".

3.2.5.2. Again for efficiency, the expert judgements within a region may be bundled together for consideration when going through the proposed process below. This will be important if there are inter-relationships between the expert judgements (e.g. agreeing the allocation of expenses between two funds and calibrating an expense capital model) or if similar techniques are used (e.g. analysis of equity and property risk for a capital model).

3.2.5.3. The efficiency of the process can also be improved by considering common themes or principles which can be used to leverage effort in areas which require a large number of expert judgements. For example, an insurer with a broad range of risks will need a very large number of correlation assumptions, each of which will have its own expert judgement. "Industrialising" this process may be an effective use of the uncertainty reduction budget. "Industrialising" may include having a standard template and standard analysis for the draft brief for the experts (discussed below) and having "implied expert judgements" such as a common ratio between the calibration of market falls and increases in volatility across many different asset classes in a capital model.

3.2.5.4. Also note that the techniques for assessing the materiality of each "region" (e.g. profit and loss attribution) will be different to those at the more detailed level (e.g. sensitivity testing of parameters/methods).

3.3. Process Overview

Before getting into the detail of the process, it is helpful to have a high-level overview of the process. This is shown in Figure 1.

As we have previously mentioned, the precise details of the process will vary from one firm to another and will also depend on the characteristics of the particular expert judgement under consideration.

3.4. Preliminary Assessment of Judgement

3.4.1. After an expert judgement governance framework has been set up, the expert judgement policy can be applied to a judgement to establish whether or not it meets the definition of expert judgement. If it does, the expert judgement process should be followed. If it does not, then a simpler governance process should be followed.

3.4.2. Materiality will be an important factor in indicating whether a judgement meets the definition of expert judgement. For some judgements, it will be entirely clear whether or not they should be considered an expert judgement; for others, it may be necessary to complete some of the initial "defining the problem" steps in the expert judgement process to decide whether or not the judgement meets the expert

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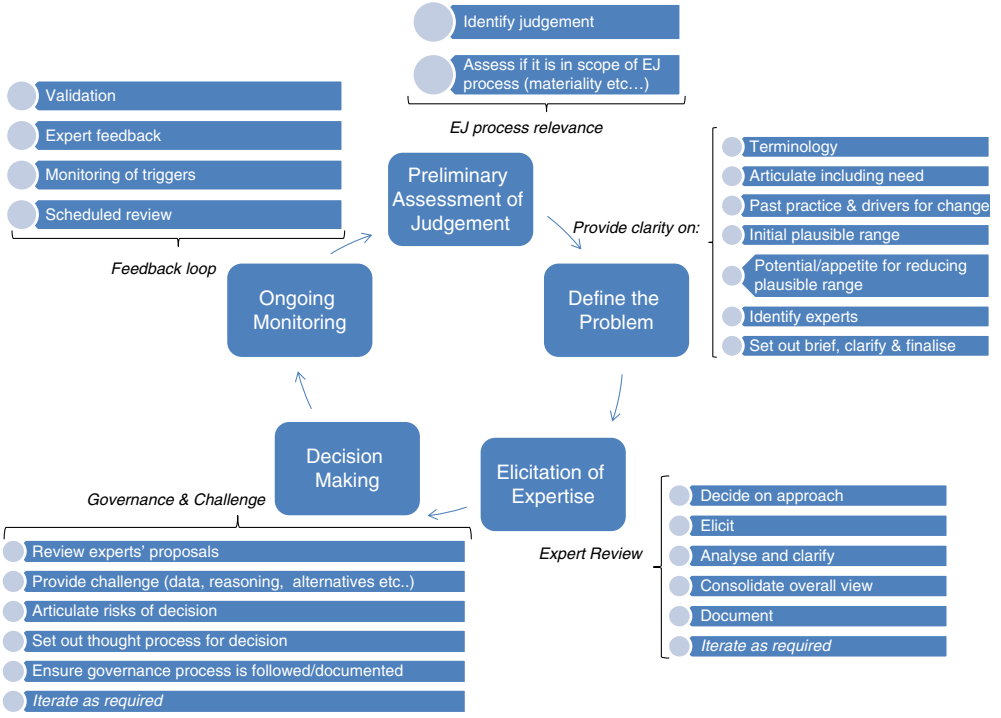

Figure 1. High-level overview of process

judgement definition. Expertise will commonly be used in determining what information is relevant, how it should be interpreted, how seemingly conflicting lessons can be reconciled and in making a decision.

3.4.3. The appropriateness of the non-expert judgement governance processes should be assessed from time to time to ensure they remain suitable. For efficiency, we would suggest that the two processes are similar, but with less rigour being applied for the non-expert judgement process. We recommend that there should be a mechanism to escalate a particular judgement to be dealt with under the expert judgement process in exceptional circumstances. Such circumstances should feed into the review of governance processes.

3.5. Defining the Problem

Although it is tempting to move straight to seeking views from experts, we believe that it is essential to set out clearly the problem that expert judgement is required to solve. The investment of time in this aspect is likely to significantly increase the relevance of the expert advice received and therefore the robustness of the ultimate decision taken by the firm. There are a number of elements in defining the problem, and these are set out in the following sub-sections.

3.5.1. Define terminology

3.5.1.1. It is critical to define terminology clearly. This is especially the case when seeking external expertise, but it is also important when the expertise is sourced internally. This will ensure that

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everyone involved has a consistent understanding of the terminology, and will also ensure that this consistency is maintained over time when the expert judgement is reviewed in subsequent periods. Clarifying "jargon" may also help to remove barriers to including relevant expertise from different academic and professional fields.

3.5.1.2. Some errors in expert judgement have occurred because the identification of the risk, the data sourced and the modelling approach have been based on subtly different definitions. For example, does "lapses" mean the absolute level of lapses or differences from expected? Is this the "expected" the current valuation assumption, the valuation assumption made in the year of the observation or some other figure? If an increase in lapses is expected following a market fall (sometimes embedded in the asset-liability model), should the data be transformed to include only the lapse experience net of the market-dependent factor? Defining terminology in a clear and unambiguous manner will help reduce the risk of such issues.

3.5.2. Articulate what the expert judgement relates to and why it is required

3.5.2.1. It is useful to start with the basics so that it is clear what the expert judgement relates to and why it is required. A good starting point is to set out which of the following categories the expert judgement falls into:

i. methodology;
ii. assumptions (including parameters); and
iii. approximations.

If the judgement relates to methodology, any practical constraints around that judgement should be considered by those responsible for obtaining the expert judgement. For example, are there any constraints resulting from the form of the input data, or the form of the output data required by other parts of the model? As we will see in subsequent sections, a key part of the elicitation technique will be exploring the experts' thought processes that should not be constrained by the existing modelling. Although these practical constraints need to be borne in mind, care needs to be taken to avoid unduly restricting the range of possible answers too early.

3.5.2.2. It is also important to establish the context and purpose, and in particular, what model output metrics are of ultimate interest. For example, assessing the impact on profit (e.g. Market Consistent Embedded Value profit), pricing metrics (e.g. new business contribution to embedded value), capital requirements (e.g. internal economic capital) or even the balance sheet as a whole (e.g. the Solvency II balance sheet).

3.5.2.3. As well as identifying the output metrics of interest, it is also useful to be clear on the ultimate purpose of the model output. For example, is it being used for calculating best estimate technical provisions, assessing capital requirements, pricing, assessing a reinsurance programme, etc.?

3.5.2.4. Once the expert judgement category and key model output metrics have been established, it is helpful for the firm to set out a high-level understanding of its exposure. Examples might include, "Financial losses are incurred when:

- Fewer people die than expected…
- Interest rates rise…
- Expenses are higher than expected".

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This can guide the areas in which more certainty is preferable, which can in turn inform the nature and extent of questions to ask the experts. It can also highlight those areas of expert judgement that may be multi-faceted and where judgements may need to be broken down for each facet. Examples of some complications that could occur include:

- The exposure may be different in different parts of the business. An increase in lapses on non-profit business typically leads to a loss of future profits, whereas an increase in lapses on with-profits reduces the value of options and guarantees.
- A further level of granularity may be required. For example, when considering interest rate exposures, it may be appropriate to consider different changes in interest rates at different durations. The level of granularity required may also differ between different users of the model, for example, the pricing actuary may want additional factors relevant for pricing that may not be required by the capital actuary.
- There may be interaction effects. For example, exposure to interest rates may "flip" as the life expectation of annuitants changes.

3.5.2.5. After the nature of the expert judgement has been articulated, it is important to set out the reason why expert judgement is required. The general context may be due to poor data in terms of quality, volume or relevance; or it could be because a risk is being modelled for the first time; or it could be part of a review of risks which are material to the firm or which are highly subjective in their nature (in both cases the expert judgement could provide useful validation or challenge). The specific event which has triggered the expert judgement to be considered could be one of many such as:

- a scheduled review of an existing judgement;
- a non-scheduled review of an existing judgement owing to monitored triggers being exceeded, validation queries or audit queries; and
- more certainty being required.

3.5.3. Establish what was done previously

3.5.3.1. Although in certain circumstances there may not have been an expert judgement made previously for the area in question (e.g. a risk which was not previously modelled), a previous judgement will often exist. Generally, it is important to capture information on this previous expert judgement as it is likely to provide useful input into the current expert judgement. This will include not just the decision made, but also the approach to forming the decision including the key drivers underlying the decision and the information sources used. If the plausible range of the expert judgement was assessed previously, this should also be captured, as well as any assessment of the impact of the plausible range on the output metrics.

3.5.3.2. There is an argument that a scientific approach to analysis should be used under which the analyst should draw their conclusions from the evidence alone without any pre-conceptions. We would challenge this approach. An expert will generally have prior beliefs when undertaking any investigation. Indeed, it could be argued that a benefit of being a member of the actuarial (or any) profession is that its members are informed by the development of knowledge and skills over many years of past practice, and these are likely to influence the individual's prior beliefs. Surfacing these prior beliefs and making them explicit will highlight those beliefs and facilitate challenge to the implicit assumptions made. The ability to communicate with others (including the introduction of

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new ideas) is greater if the individual develops a commonality in language and an understanding of what was done previously.

3.5.3.3. Nevertheless, some decision makers may feel that this step unduly restricts the range of possible outcomes that should be considered in forming an expert judgement, particularly if the area is novel or previous precedents are unhelpful or misleading. If this is the case then this element of defining the problem may be skipped in the first iteration of the process.

3.5.3.4. Aspects of prior beliefs will be recorded in the documentation of the expert judgement used in previous years. However, decision makers should be mindful that documents are summaries of historical thinking and may miss the context and the competing factors that were relevant in coming to a decision. In particular, previous decisions may have been informed by tacit knowledge which cannot always be recorded.

3.5.4. Identify potential drivers for change to previous expert judgement

3.5.4.1. Once the previous expert judgement has been captured, it is sensible to consider what drivers exist which could make it appropriate to change the previous judgement. There are a wide range of potential drivers, examples of which include:

- an additional year of data;
- updates to the information in previous data sources, for example the correction of errors in historical data or changes in methodology applied retrospectively;
- identification of potential new information sources (e.g. new research papers);
- improvement in actuarial and statistical techniques (e.g. techniques which were previously prohibitively expensive now become sufficiently cost-effective to be viable for consideration);
- changes to the key drivers underlying the previous expert judgement (e.g. legislative changes);
- identification of new drivers which may potentially be useful in forming the decision;
- changes to related expert judgements (e.g. longevity trend and mortality trend);
- the desire for greater precision regarding the expert judgement; and
- changes in the level of risk or the potential level of risk, for example new business written or through an upcoming transaction.
- Identification of new experts to contribute to the expert judgement.

The value in systematically considering this element of the process may result in uncovering drivers which would otherwise not have been identified.

3.5.4.2. The information sourced should be used to correct or widen the factual basis on which previous decisions were made, to challenge the prior beliefs or to highlight new ways of thinking about the same problem. This approach is based on previous expert judgements being based on verifiable statements and the information source chosen to be most relevant to these statements. For example, the prior beliefs may include that the insurer has sold annuities to wealthier than an average population, the wealthier already have access to the best medical care and so the scope for further improvements from the expected level is lower than for the general population. What evidence can be used to test the demographic profile of the insured portfolio? Are the wealthier more likely to use private healthcare and is the benefit of private healthcare material? Are future

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improvements likely to be a result of disseminating the best in the current healthcare or in the pipeline of expensive new medicine unlikely to be available on the NHS? The firm may need to consult their experience analysis, industry and population statistics, along with experts from other fields such as medical underwriters, gerontologists, cardiologists, oncologists, medical scientists, etc.

3.5.5. Prepare initial estimate of plausible range

3.5.5.1. As mentioned in section 3.2.2, we believe that the concept of a plausible range for expert judgements is helpful. At this problem definition stage of the process, we would suggest that the initial estimate should be quick and approximate, rather than being slow and detailed.

3.5.5.2. There are two distinct aspects to the concept of a plausible range: the plausible range of the expert judgement (effectively a measure of the uncertainty around the judgement), and the impact of that plausible range on the model output metrics of interest. We will first consider the plausible range around the expert judgement, and then consider its impact on the model output metrics. For certain expert judgements, especially those relating to methodology, the plausible range is likely to be expressed in qualitative terms rather than in quantitative terms. For example, the list of plausible families includes the normal distribution, the Student's T distributions, etc.

3.5.5.3. If this is not the first time that the expert judgement is being made, then a good starting point would be to consider the previous expert judgement (as highlighted in section 3.5.3), and in particular the plausible range around that judgement. Assuming that such a plausible range was previously assessed, the next step would be to consider whether there are any factors or new information during the period as the judgement was made which may have changed the plausible range. These factors may increase the uncertainty or decrease it, with a corresponding increase or decrease in the plausible range.

3.5.5.4. If there was no plausible range stated for the previous expert judgement, the documentation around the previous expert judgement should be analysed to try to get a sense for the uncertainty around the judgement. This should help to form a view on an initial plausible range, albeit approximate. We would recommend that this estimate should err on the side of caution, that is an estimated plausible range which is likely to be larger than the true plausible range.

3.5.5.5. The above process should result in a revised initial plausible range along with a brief rationale behind any changes from the previous plausible range.

3.5.5.6. If this is the first time that an expert judgement is being made on the item of interest, then an estimate needs to be made of both the expert judgement and the plausible range around that expert judgement. Within the confines of the requirement for the initial estimate to be quick and approximate, clearly the initial estimate of the plausible range in these circumstances is likely to be large given the uncertainty. In forming the view of the initial plausible range, account should be taken of any relevant information sources identified.

3.5.5.7. Once the initial estimate of the plausible range for the expert judgement has been set out, the impact of this plausible range on the model output metrics of interest should be estimated. So let us say that for a particular expert judgement the initial central estimate is B with an initial estimate of a plausible range from A to C, then we want an estimate of what the output metrics will be at A, B and C. This will give a sense of how material the expert judgement is in relation to the

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output metrics. Again, speed is the key feature at this stage of the process, which may therefore involve approximations. We recognise that this will often not be straightforward, and that quite broad approximations may be required. Indeed, the impact on the model output metrics may even need to be done in the form of a qualitative assessment (e.g. high–medium–low) rather than a quantitative assessment. However, we feel that it is an important step to understand how significant the expert judgement is in relation to the model outputs. If this has been performed as part of the previous expert judgement, this is likely to be helpful in relation to the estimation for the current expert judgement.

3.5.5.8. Where there are multiple related expert judgements (e.g. the base mortality table and the mortality improvement factors for pricing an annuity portfolio), the initial estimate of the impact may focus on the main factor with the relative importance of the two related judgements being considered further through the process.

3.5.6. Assess potential for reducing plausible range

3.5.6.1. After the initial estimate of the plausible range has been completed, it is useful to consider whether there are any ways of reducing the plausible range, especially for those expert judgements with the most material impact on the model output metrics. For example:

- Is the engagement of additional experts likely to reduce the plausible range?
- Would further analysis of the existing data lead to a reduction?
- Would analysis of new information sources have an impact?
- Would an alternative methodology help (e.g. a new model)?

3.5.6.2. For each of the potential methods, there should be a qualitative assessment of the likelihood of reducing the plausible range, along with an approximate assessment of costs and timescales (which again may need to be formed qualitatively).

3.5.6.3. Practicalities should also be borne in mind regarding any methodology changes. For example, the absence of an in-house expert on longevity may steer the firm to choose a statistical aggregate mortality method rather than use more subjective judgement to build a cause of death model. It may also be proportional for a firm with a sizeable exposure to use more than one model to inform their choice of parameters.

3.5.6.4. As we explore in subsequent sections of this paper, we are proposing an approach under which successive iterations of the process over a number of years may replace certain aspects of expert judgement with data. For some assumptions, the marginal benefit of using expert judgement to reduce uncertainty diminishes as the process becomes more data orientated. In effect, the knowledge required to determine the assumption becomes embedded in the process used to derive the assumption rather than remaining in the tacit skills of the expert. An example is the process now used to determine implied volatilities in the realistic balance sheet. Although uncertainty remains, it is considered by many firms that it is not practical/feasible to use expert judgement to determine a more precise assumption. For other expert judgements, such an approach may not be appropriate and the firm may wish to build the expertise into the firm over time. For those who are interested in learning more in this area, the authors recommend considering techniques such as "deep smarts" as described in the study by Leonard & Swap (2005).

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3.5.7. Assess appetite for reducing plausible range

3.5.7.1. The key decision makers should be identified as the success or failure of the expert judgement process and is likely to rest on the ability to communicate clearly with individuals within this group. The appropriate individuals may vary according to the area covered as well as the governance framework. For example, certain individuals may be more comfortable with market risks than demographic risks and the governance group may need to be extended when discussing operational risk.

3.5.7.2. Having assessed the potential for reducing the plausible range, there should be engagement with the identified decision makers to assess their appetite for reducing the plausible range. If the firm has already established the overall expert judgement uncertainty total impact, this should help inform the view as to whether this particular expert judgement merits an investment from the expert judgement uncertainty reduction budget to reduce the plausible range. The cost of capital may also feature in the decision. If so, the decision makers should confirm the practicalities such as:

- Amount of uncertainty reduction budget available for this particular expert judgement.
- The timescales over which the revised judgement needs to be made.
- The availability of the decision makers to provide input into the process before the final judgement being made.
- What aspects around the judgement are they most concerned with?
- In a wider context, are they happy for the judgement in this area to simply be "within the pack" of their peers (where relevant), or are they keen to minimise the plausible range?

3.5.7.3. The qualitative impact of the judgement should also be discussed with the decision makers. For example, if the risk management strategy is dependent on the ability to hedge out equity risk, the significance of basis risk would be worth exploring. If the strategy of the firm is based on better underwriting, the granular judgements underlying the underwriting process may be scrutinised more carefully than the financial impact of a change in the valuation assumption within the plausible range alone would suggest.

3.5.8. Prepare overview of need for expert judgement

Based on the information gathered in the previous steps in the process, an overview of the need for expert judgement should be prepared including the timescales over which the work will be required. This overview document will be used in subsequent steps.

3.5.9. Identify personnel involved and their roles

3.5.9.1. To be able to form an expert judgement, suitable experts will need to be identified. This step needs to be mindful of the practical constraints set out by the decision makers such as budget and timescales.

3.5.9.2. It is useful to bear in mind that a more insightful result may be achieved from using a wide range of experts rather than too many in a narrow area, that is breadth and depth of expertise are both important. There is also the problem of self-referencing: a model that appears to be industry standard may actually only be accepted within one school of academia, so it is sensible to ensure there is a sufficient breadth of expertise.

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3.5.9.3. If the judgement is not entirely new, then the documentation around the previous expert judgement should be helpful in identifying at least some potential experts. Experts will come from two sources:

i. internal experts, that is those individuals who work for the firm; and
ii. external experts.

3.5.9.4. A list of internal individuals who may have the necessary expertise to be usefully involved in forming the expert judgement should be drawn up, including the nature of their relevant experience, and an initial view on their relative level of expertise. It is sensible to try to ensure that the breadth of the expertise covers the key business areas that will be impacted by the decision.

3.5.9.5. If it is felt that the internal expertise is insufficient in relation to the importance of the judgement or may not achieve the targeted reduction in the plausible range, a list of external experts should also be identified. Initially the external experts may be by company or by academic institution rather than by individual. We would encourage the firm to try to retain sufficient internal expertise so that it can effectively critique the work of others.

3.5.9.6. The overview of the need for expert judgement prepared in the previous step should then be sent to the identified experts to check their availability, interest and indicative cost where appropriate.

3.5.9.7. Any other roles relating to the expert judgement should also be documented, for example coordinator, decision makers, etc. For certain judgements, it may be that the experts are also the decision makers. Even in this context it is useful to give thought to whether there may be additional experts available internally or externally who could materially enhance the quality of the expert judgement or provide insight and context on the business implications of any judgement. It is also important to consider how to ensure that there is an appropriate level of independence and that expert judgements are subjected to an adequate level of challenge.

3.5.10. Set out the draft brief for the experts

3.5.10.1. A brief for the experts should be drafted based on the information gathered in the previously completed steps. The aim of this is to ensure that all of the experts are clear on exactly what is being asked of them, and to give them an opportunity to ask for aspects to be clarified or modified before the brief being finalised. Having a common format and analysis accompanying the draft brief for the experts will aid the communication of ideas and potentially make the decision making more efficient.

3.5.10.2. The document should build on the overview document prepared in an earlier step. If external expertise is being used, it may be considered appropriate for certain aspects of the information to remain confidential in which case such confidential information should be detailed within an additional document. Care should be taken before deciding to withhold information from experts, as this has the potential to make the expert judgement less robust.

3.5.10.3. Even in the case where the experts are also the decision makers, we believe that the development of a brief is worthwhile as it captures all of the key information around an expert judgement, which is likely to enhance the quality of the expert judgement and is a key stage in the documentation requirements.

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3.5.10.4. The information to be included within the draft brief will be dependent on the nature and materiality of the expert judgement as well as the relationship between the experts and the decision makers, but may include aspects such as:

i. Definitions of terminology to ensure consistency of interpretation by the experts of the various terms used in the brief.

ii. Articulation of what the expert judgement relates to and why it is required, including aspects such as:
   - whether the judgement relates to a methodology, an assumption or an approximation;
   - the model output metrics of interest including purpose and any qualitative aspects;
   - a high-level overview of the firm's exposure and the strategic importance of the judgement;
   - the general context of why the judgement is required, for example poor data quality, volume or relevance, etc; and
   - the specific event which has triggered the expert judgement to be considered, for example scheduled review, non-scheduled review, greater precision required, a previously unmodelled risk, etc.

iii. Documentation of what was done previously including aspects such as:
   - the approach to forming the decision including the information sources used, experts' views and rationale, key drivers underlying the decision, etc.
   - the actual decision made, when it was made, the scheduled review date and triggers for non-scheduled review;
   - a clear logical thought process behind the decision;
   - any assessment made of the plausible range and its impact on the output metrics; and
   - any related judgements.

iv. Articulation and analysis of any potential drivers for change to previous expert judgement such as:
   - updates to existing information sources and any new information sources identified;
   - changes to key drivers underlying previous judgement and identification of potential new drivers; and
   - a desire for greater precision.

v. Initial estimate of plausible range.

vi. Potential information sources (if the judgement relates to something new).

vii. Practicalities:
   - an indication of the appetite for reducing the plausible range;
   - any areas of concern for decision makers;
   - timescales over which the experts' views need to be provided;
   - summary of the proposed elicitation approach including format in which experts' views will be required and the likelihood of iterations between the experts and the decision makers.

3.5.10.5. If the experts are actuaries, they will need to abide by the relevant TASs, which include a requirement for the actuary to make clear in any report their understanding of the high-level purpose of the advice as well as key assumptions made and inherent limitations. A well-written brief (including clearly set out expectations of the format in which the experts' views must be given) should facilitate this.

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3.5.10.6. Information sources can be wide ranging such as internal data, academic papers, surveys, publications, data from reinsurers, data from industry bodies, data from the actuarial profession, data from consultancies, etc. Each of them has the potential to provide a particular insight or perspective and it is important that they are captured in the brief so that they can be considered during the elicitation and decision-making processes.

3.5.10.7. We believe that it is important to clearly set out the format in which the experts' written views are expected. This should have a logical structure containing information such as the information sources used (including any additional information sources beyond those set out in the brief); the relative importance attached to each information source and rationale; the thought processes leading to their recommendation; their assessed plausible range including rationale; how long the recommendation is valid for; the triggers for non-scheduled review; and any restrictions on how the judgement should be applied if the scope of the judgement is any different to that set out in the brief.

3.5.11. Clarify and finalise brief

3.5.11.1. Once the draft brief has been issued to the experts, the experts should provide feedback on any areas of the brief that they feel are unclear, or where they believe the proposed approach to forming an expert judgement could be improved. For instance, the experts may not easily be able to answer the question asked but if some changes are made to the nature of the question or the frame of reference, the experts may be able to provide much more useful input. An example of this would be where the experts may be able to describe a relationship between *risks* in a situation where the correlation matrix approach used by the firm is expressed in terms of correlation between *capital requirements* which are specific to the firm. Another example would be the situation under which the modelling framework is for unconditional stresses, whereas the expert's frame of reference is based on what is happening in the current environment. A further example would be where the particular assumption will vary through the business cycle. It is likely that compromises will need to be made: we believe that it is preferable for this to be done explicitly rather than implicitly.

3.5.11.2. The brief should then be updated to try to ensure clarity and to take into account any workable suggestions from the experts. There may need to be more than one iteration before the brief can be finalised.

3.6. Elicitation of Expertise

3.6.1. A number of different approaches can be taken to elicit views from the chosen experts including:

i. written responses to the brief;
ii. interview with each expert;
iii. interview with all of the experts together without the decision makers;
iv. interview with all of the experts together along with the decision makers; and
v. some combination of the above.

3.6.2. In addition, there may be more than one iteration. For example, one approach might be:

1. The experts initially provide a written response.
2. The individual managing the elicitation may then analyse the responses of each expert and draft a list of questions for each expert where the advice or logical thought process is unclear, or where

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the advice lies outside the original estimate of the plausible range or differs significantly from other experts, and then interview each expert to address these points.

3. The elicitation manager may then consolidate the information from the experts, attempt to combine their advice into a revised central estimate and revised plausible range, and prepare a report for the decision makers highlighting any key areas that need to be explored further with the experts.
4. The experts may then be invited to a group interview with the decision makers to give the decision makers an opportunity to challenge the experts on their views.

3.6.3. The most appropriate approach will depend on the nature and importance of the particular expert judgement, and the relationship between the experts and the decision makers.

3.6.4. Some of the key characteristics of having expertise are that the expert uses a consistent set of principles to provide advice on a range of subjects and is also able to amend their view as the context changes. The lack of ability to explain recommendations may be due to a lack of logic (i.e. poor quality judgement) or it could be because the expertise is grounded in tacit knowledge (which could potentially mean that the judgement is sound). It is important to try to establish a clear logical thought process and relevant context behind each expert's recommendation during the elicitation as this is likely to feed into the relative weight given to that particular expert's views when combining them with the views of the other experts. However, it should be borne in mind that in forming a recommendation, an expert often has to combine both quantitative and qualitative information, which is not an exact science.

3.6.5. The elicitation manager and the decision makers will need to be mindful of bias, and the elicitation should be designed to try to minimise this risk. Bias could occur both in terms of the views of the experts, and also how these views are ultimately taken into account by decision makers. For example, one of the experts may be more vocal than the others during the group interview of the experts, which could bias the overall view towards the vocal expert. Certain techniques have been developed to try to reduce the effects of this type of bias such as the Delphi method and the pairwise comparison method. See Cooke & Gossans (1999) for more discussion on this topic. Examples of other types of biases which should be borne in mind include anchoring and "group think".

3.6.6. Combining the views of the experts into an overall view and plausible range can be challenging, especially if the views of some of the experts have non-overlapping plausible ranges. Again, Cooke & Gossans (1999) provide some possible techniques such as global weighting and item weighting. Such techniques rely on being able to assess the relative calibration and informativeness of each expert through use of approaches such as multiple seed variables. Unfortunately, such approaches may not always be practical (especially where the judgement is qualitative in nature rather than quantitative), and more approximate methods may need to be used to combine the views of the experts. Whichever approach is used, it should follow the general principles of being clearly articulated and having a logical structure to the thought process.

3.7. Decision Making

3.7.1. Once the views of the experts have been established and put through appropriate levels of scrutiny and challenge, the decision makers need to reach a decision. The decision makers should review the brief and any additional information sources that were kept confidential from the experts. They should also review related expert judgements to ensure consistency across similar judgements.

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3.7.2. In a similar manner to how the experts had to provide their views, we believe that it is important that the decision makers clearly set out their thought processes as to how they reached the decision. This should have a logical structure containing information such as the information sources used (where in this case the experts' views are also considered to be information sources); the relative importance attached to each information source and rationale; the thought processes leading to the decision and a statement of the decision; their assessed overall plausible range including rationale and the impact of that plausible range on the output metrics; the date that the decision should be reviewed; and the triggers for non-scheduled review. Such a structure will facilitate any subsequent validation and make the next review of the expert judgement more efficient.

3.7.3. Depending on the firm's governance structure and the relative importance of the particular decision, the recommended decision may need to go to higher-level decision-making bodies for challenge and approval, which may result in further iterations of the process. We believe that the approach that we have proposed should help to facilitate this multi-layer governance structure by clearly setting out the thought processes underlying the decisions made.

3.7.4. The key elements of the expert judgement should be captured in an expert judgement register, which is a tool that we believe will make subsequent monitoring and consistency more efficient. We expand on the concept of an expert judgement register further in section 6.1.

3.7.5. The final decision, overall plausible range and a summary of the rationale behind the decision should be communicated back to the experts. This will give the experts an opportunity to flag any serious concerns they may have about the decision which can then be fed back to the decision makers.

3.8. Ongoing Monitoring

3.8.1. After a decision has been made, it is important to make sure that there is a robust system in place to monitor the decision. The monitoring should concentrate on the context underlying the judgement and the key triggers that the context has changed (that had been identified during the decision-making process for non-scheduled review). Again, the expert judgement register could help with this process. The monitoring framework should also pick up when expert judgements are approaching their scheduled review date to ensure that they are reviewed in a timely manner to gain comfort that they are still appropriate.

4. Practical Example

4.1. Situation

4.1.0.1. Our practical example is designed to demonstrate expert judgement using the process as outlined in section 3. We have chosen annuitant longevity as an example that will be familiar to many readers. Our focus is on the process and this example is not intended to be viewed on longevity assumptions.

4.1.0.2. We use the example of a newly established life insurance company (ABC Life) that intends to sell bulk annuity business. ABC Life will be Standard Formula firm under Solvency II.

4.1.0.3. Management recognise that a key judgement is the future mortality improvement assumptions. They proceed with the process outlined in section 3.

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4.1.1. Preliminary assessment of judgement

4.1.1.1. As mortality improvements are a key risk for insurers writing annuity business, it is clear that the judgements around mortality improvement assumptions fall into the expert judgement category.

4.1.2. Defining the problem

4.1.2.1. Solvency II requires the technical provisions to be calculated using the best estimate of liability for its annuity portfolio. In addition, other capital and financial measures for ABC Life also require a best estimate of the annuity liability. To calculate the liability they will require assumptions for the mortality of their portfolio in future years, in addition to other assumptions. The problem is: what will the death rates be in the portfolio in future years?

4.1.3. Define terminology

4.1.3.1. Two key aspects are defined. First, there is a base mortality table which defines the rates of mortality for a particular year. There may be rating factors applied to the base mortality table for specific policies or groups of policies. The second is the annual rates of improvement applied to the base mortality table in order to determine the mortality rate in each year of the projection. The annual improvement rate is defined as the percentage reduction in mortality rate from one year to the next for a given age. These annual rates of improvement will be represented in a table showing the improvement rate, calendar year and age. Again, there may also be different tables used depending on the rating factors of the policy or group of policies.

4.1.3.2. For this example, in order to just consider one situation, we use annual improvement rates for males as the expert judgement that we are considering.

4.1.4. Articulate what the expert judgement relates to and why it is required

4.1.4.1. Area of judgement. The annual rates of improvement relate to experience assumptions.

4.1.4.2. Metrics of interest. As ABC Life is a bulk annuity writer it considers all of the following metrics important:

- IFRS profit;
- MCEV profit (including new business contribution);
- statutory balance sheet;
- Solvency II balance sheet and capital requirements;
- ICA; and
- internal economic capital forecasts.

4.1.4.3. High-level understanding of the firm's exposure. The high-level description of ABC Life's exposure is as follows: financial losses are incurred when fewer lives insured die than expected.

4.1.4.4. Areas where judgements may need to be broken down. The pricing team may require more granular assumptions than the financial reporting teams.

4.1.4.5. Trigger for expert judgement. as ABC Life is going to launch a new product, this is the trigger for the expert judgement.

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4.1.5. Establish what has been done previously and drivers for change to previous judgement

4.1.5.1. This is the first time that ABC Life has made a judgement in these areas and therefore there are no previous judgements to review.

4.1.6. Prepare initial estimate of plausible range

4.1.6.1. One expert will need to be involved at the preparation of the initial estimate of the plausible range. A model is required to project future mortality improvements. There are a number of options for mortality projection models (Continuous Mortality Investigation (CMI), 2013):

- the "92" Series and Interim Cohort Projections;
- Adjusted Interim Cohort Projection;
- ONS National Population Projections;
- P-spline projections;
- Lee-Carter projections; and
- The CMI Mortality Projections Model.

4.1.6.2. For our initial assessment we will use the CMI model which we understand to be the most common model in use. For this example, we use the CMI_2014 model. Again, other valid options exist; here we simply exemplify the process.

4.1.6.3. The CMI model allows the user to input a different initial rate of improvement to the model other than the standard parameters. ABC Life does not have access to further information regarding initial rates of improvement. Therefore the expert recommends that the initial rates in the core model be used.

4.1.6.4. There is no default rate of improvement set in the CMI model and the user is left to establish one. The expert's initial estimate is based on benchmarking using the data in Table 1 from publicly available PRA returns and past improvement rates in Figure 2.

4.1.6.5. Based on this information, the initial plausible range for males is selected as a central estimate of 2% improvement rate with a 1.5% and 2.5% selected as the 25% and 75% percentiles, respectively.

4.1.6.6. The core CMI model converges to the long-term rate over a period of time using default parameters. The model has the flexibility for users to alter these parameters. The expert recommends that at this stage there are no modifications to the default rates of convergence.

4.1.6.7. The CMI model has the ability to add or subtract a constant rate of improvement. Owing to a lack of additional information available to the company the expert recommends that this is set to 0.

4.1.7. Initial estimate of plausible range

4.1.7.1. For simplicity, we estimate the financial impact of the plausible range by considering a portfolio of 10,000 males aged exactly 65 being paid an annuity of £10,000 annually in advance. We use the best estimate of liabilities as the metric of interest. The valuation is assumed to use a 3% interest rate and 100% of PMCA starting 01 July 2000 and the CMI 2014 model. This gives the results shown in Table 2.

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Table 1. Continuous Mortality Investigation Model Long-Term Improvement Rates for Selected Insurers

Company Reference	Company	Male Long-Term Rate (%)
A	Company 1	2.25
B	Company 2	2.25
C	Company 3	2.00
D	Company 4	2.00
E	Company 5	2.25
F	Company 6	1.90
G	Company 7	2.25
H	Company 8	2.00
I	Company 9	1.75
J	Company 10	1.75
K	Company 11	2.00

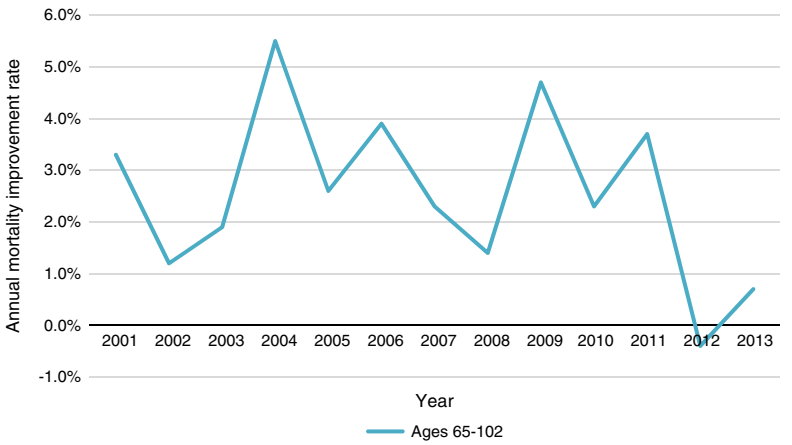

Figure 2. Males – observed crude annual mortality improvement rates in England and Wales population (CMI, 2014)

4.1.8. Assess the potential for reducing the plausible range

4.1.8.1. As the expert's initial assessment of the plausible range has been completed, she now considers the potential for reducing the plausible range.

4.1.8.2. The initial estimate of the plausible range has been determined through the use of the CMI model and benchmarking to other insurers assumptions. There are further approaches that could be used and these may reduce the plausible range. These are listed below along with estimates of timescales and costs:

iv. Performing further analysis on past population and industry mortality improvements to extrapolate the long-term rates of improvement (10 days, using an internal actuary).

v. The use of different data sources including socio-economic specific data (20 days, using an internal actuary).

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Table 2. Practical Example – Initial Estimate of Plausible Range

Scenario	Long-Term Rate of Improvement (%)	Present Value of Annuities (£m)	Difference to Best Estimate (£m)	Difference as a Percentage of Best Estimate (%)
25th percentile	1.5	1,671.5	–26.1	–1.54
Central estimate	2.0	1,697.6	–	0
75th percentile	2.5	1,724.9	+27.3	+1.60

vi. The use of a cause of death model (40 days using an internal actuary).

vii. The use of two additional external experts (10 days/expert, £2,000/day cost).

viii. Using a different mortality projection model (10 days/model, using an internal actuary).

4.1.9. Assess the appetite for reducing the plausible range

4.1.9.1. As mortality improvements are a key assumption in the business model, the Board of ABC Life want to ensure that they reduce the plausible range as much as practically possible. However, the Board appreciate that they are constrained by a desire to be quick to market with their bulk annuity offering and the limited time that the actuarial team has available. The Board decide on balance that they are willing to devote £50,000 of spend for external experts and 60 days of an internal actuary's time.

4.1.10. Prepare overview of need for expert judgement

4.1.10.1. The expert judgement on the mortality improvement rates is required as a key assumption in many of the models used in ABC Life. The Board is comfortable with a timescale of 3 months to conduct further analysis.

4.1.11. Identify personnel involved and their roles

4.1.11.1. Management has identified the two external experts that they wish to use; one medical expert and an external actuary. These are in addition to the internal actuary used. Their roles are defined as follows:

i. The internal actuary is to explore methods of improving the accuracy of the central estimate and reducing the plausible range.

ii. The external actuary is to provide an independent review of the internal actuary's work, identify additional data sources and provide an additional view of the central estimate and plausible range of the long-term improvement rate.

iii. The medical expert is to provide an expert opinion on likely future medical advances and their expected impact on annuitant mortality.

4.1.12. Set out the brief for the experts

4.1.12.1. The brief for the experts is shown in Table 3.

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Table 3. Brief for the Experts

Definitions of terminology	The base mortality table is the rate of mortality for a particular year The annual rates of improvement are the percentage reduction in mortality rate from one year to the next at a given age. The annual rates of improvement will be represented in a table showing the improvement rate, calendar year and age				
Articulation of expert judgement					
Methodology, assumption or an approximation	Assumption				
Model output metrics of interest	IFRS profit MCEV profit (including new business contribution) Statutory balance sheet Solvency II balance sheet and capital ICA Internal economic capital forecasts				
High-level overview of the firm's exposure	ABC Life is a new life insurance company specialising in bulk annuities. Future improvements in the mortality rates of its annuity book are a major source of risk for ABC Life				
General context of why the judgement is required	Future mortality rates are uncertain owing to uncertainty around future medical advances, future public health, and future public and private medical spending and availability				
Event trigger for requirement of expert judgement	New assumption owing to formation of ABC Life				
Previous documentation	There is no previous documentation as this is the first time the judgement is being made				
Articulation and analysis of any potential drivers for change to previous expert judgement	Not applicable – this is a new judgement				
Initial estimate of the plausible range	Scenario	Long-Term Rate of Improvement (%)	Present Value of Annuities (£m)	Difference to best estimate (£m)	Difference as a Percentage of Best Estimate
	25th percentile	1.5	1,671.5	–26.1	–1.54
	Central estimate	2.0	1,697.6	–	0
	75th percentile	2.5	1,724.9	+27.3	+1.60
Potential sources of data	ONS population statistics Continuous Mortality Investigation (CMI) data CMI projection models Reinsurance rates/advice from reinsurers Other sources of data deemed appropriate by the experts				
Practicalities					
Appetite for reducing plausible range	Where practical, the Board would like to reduce the plausible range, but the decision must be finalised within 3 months				
Areas of concern for decision makers	Potential for under-reserving Potential for over-reserving Potential for under-pricing Potential for over-pricing Potential for under-reporting of profitability Potential for over-reporting of profitability Stability of assumptions derived Must be justifiable to the regulator				
Timescale over which the experts' views need to be provided	3 months from now				
Summary of the proposed elicitation approach	It is expected that the experts will work independently but with mutual oversight of each other's scope work and planned approach. It is also expected that the experts will circulate draft reports between each other and meet to discuss any areas of disagreement before the production of a final recommendation from each expert				

4.1.13. Clarify and finalise the brief

4.1.13.1. There would naturally be a step for the experts to finalise the brief and for any clarification required.

4.2.1. Elicitation of expertise

4.2.1.1. The three experts after considering the evidence return with the following estimates of long-term improvement rates for males: 1.75%, 2% and 2.5%. These are accompanied with written justification from the experts for these rates.

4.3.1. Decision making

4.3.1.1. Although the formal decision will be made by the Board, this will be based on the recommendation of the Chief Actuary, who is the primary decision maker.

4.3.1.2. The experts may meet the Chief Actuary to discuss their respective recommendations and this may result in revised recommendations.

4.3.1.3. The Chief Actuary may take a number of approaches in reaching the final decision, for example:

i. take an average of the experts' views;
ii. take a weighted average of the experts' views (with the AFH determining the weights);
iii. accepting a single expert's justification based on the arguments made; or
iv. reject the views of the external experts and form an in-house view (although this may be more difficult to justify).

4.3.1.4. Whichever of these approaches is chosen, justification of the final judgement will need to be documented and approved by the Board.

4.4.1. Ongoing monitoring

4.4.1.1. Management would put in place a regular review process for this expert judgement. This could be 1 year from the date of the judgement.

4.4.1.2. There would also be trigger events that would cause the non-scheduled review of the expert judgement. These could include:

- discovery of a material error in the data used to form the judgement;
- significant additional data on mortality improvement rates becoming available;
- a significant change in industry approach to modelling mortality improvement rates;
- formal guidance from the regulator indicating that the expert judgement is not within a range they consider to be acceptable; and/or
- a level of new business that is materially above plan and/or new business that is significantly different in terms of the lives insured.

5. Validation of Expert Judgement

5.1. Role of Validation

5.1.1. Solvency II requires independent validation (and the consideration of at least certain named validation tools for those firms using an internal model). More generally, we believe that all actuarial

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models which make use of expert judgement would benefit from validation by the developers and primary users, and the more material they use, the greater the need for an independent view point. This section describes how one can validate the process described in section 3 and how the validation tools listed for internal models can be interpreted for expert judgement-based models.

5.1.2. A cycle of re-examination of the evidence and self-critique by those who made the original judgements are important parts of the feedback loop in the model design and should be encouraged. However, there are particular advantages of an independent party conducting validation:

i. An independent party can consider the purpose and consequences of the expert judgements throughout the model as a whole. This includes the extent to which the model design reflects the risks within the business (the specification) and the model outputs in aggregate and component by component. This would be in addition to a review of the methodology/ assumptions and the input parameters. A distinction can be made between qualitative reviews – a review providing assurance that the modelling approaches and assumptions made by the firm are appropriate – and a complete validation exercise.
ii. Often the purpose of an independent view point is to ensure that the judgements are made within an appropriate range of reasonableness, not to provide a second/third view. The validation can be thought of as a "conversation" designed to improve the understanding of the model, the interaction of assets and liabilities in reality and the parts of the external world that need to be included in the model. It is also a chance to reflect on the limitations of the model and the extent to which they need to be addressed.
iii. An independent validation can also consider how the expert judgements are received and used in the business and form a view if these uses are appropriate given how the expert judgement is being framed and the uncertainty. Under the internal model tests and standards in Solvency II, the validation exercise needs to cover qualitative as well as quantitative aspects of the internal model, including how the model is used.

5.1.3. EIOPA has produced consultation papers covering the governance and the tools which should or may be used to support the role of the validators. In terms of validation, in this section we focus on the appropriateness and operation of the expert judgement process (one part of the firm's governance framework) and how the validation tools may be used in the context of expert judgement. We also discuss the role of expert judgement in performing the validation.

5.2. Validation Process

5.2.1. Even once a validation process is designed and each step checked, the validators need to check that overall the expert judgement process described in section 3 is effective. The proposed process relies heavily on prior beliefs and what is possible in the time and resources available. By its nature, this will introduce biases to the expert judgements made. One role of validation is to ensure that the process remains effective rather than dysfunctional. Some indicators of dysfunctional behaviour include: mis-specification of the problem (which may have changed since the expert judgement was made); inappropriate prioritisation of the focus of the investigation; biases such as anchoring (i.e. centring judgement on advice previously given), underweighting or non-inclusion of the views of experts with a wider appreciation of the systemic nature of the area; and lack of effective monitoring.

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5.2.2. A core characteristic of the expert judgement process that we have proposed is that the thought processes behind decisions are clearly set out in a logical structure covering the information sources used, the relative importance attached to each information source and rationale, and how those information sources are used to form the decision. This structure facilitates the validation process, with each step in the decision-making process being clear and open to challenge from the validators. For example:

- The definition and materiality of the judgements required can be compared with the expert judgement governance framework (section 3.4).
- The definition of the problem and what the expert judgement relates to can be compared with the potential different ways in which the judgement is used in the business (sections 3.5.1 and 3.5.2). It can also be compared with the judgements made by the experts and any caveats/limitations in their advice to validate that the expert judgement does fulfil the brief (section 3.6).
- The identification of the potential drivers behind the expert judgement can be compared with the basis for previous expert judgements and the results from monitoring (sections 3.5.3, 3.5.4 and 3.8).
- The final expert judgement can be used to validate the method used to prepare an initial estimate of the plausible range, the potential for reducing the plausible range and the assessment of the appetite for reducing the plausible range (sections 3.5.5, 3.5.6 and 3.5.7). The estimate of the plausible range, the potential for reducing the plausible range and the appetite for reducing the plausible range can also be used to help determine the intensity of the validation work and the appropriate tools to use.
- The validators can assess if the experts chosen are appropriate and sufficient to be used for the particular judgement (section 3.5.9).
- The structure and operation of the elicitation process can be validated against the objectives (sections 3.5.10, 3.5.11 and 3.6).
- The way in which expert judgements are consolidated and used by the decision makers can be used to validate the level and range of expertise within decision makers (section 3.7).

5.2.3. Where firms have made use of external models, the firm may have used the expert judgements embedded into those external models. It is unlikely that the external model provider will have followed the same expert judgement process. Nevertheless, the validators should be able to provide a view that the process followed is appropriate. The validators should also form a view as to whether the internal experts are able to effectively critique and use the advice provided from external sources.

5.3. Validation Tools

5.3.0.1. The use of expert judgement in determining the methodology and calibration underlying the actuarial models does not preclude the use of quantitative tools for validation. Indeed, if the validator uses an alternative view point with simple statistics or rough calculations, this is likely to provide more effective challenge.

5.3.0.2. For firms using an internal model approach to calculate their SCR, Level 2, Article 242 lists the following tools which will need to be used:

- testing the robustness of the internal model;
- testing results against experience;

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- profit and loss attribution; and
- stress and scenario testing.

5.3.0.3. The explanatory text of the EIOPA 14/019 guidelines also provided some detail on tools that insurers may want to use in their validation process:

- benchmarking;
- analysis of change;
- hypothetical portfolio;
- simplified models;
- manual tracking of some internal model calculations; and
- peer review.

We consider the use of some of these tools further below.

5.3.0.4. Each of these tools are also potentially useful for validating expert judgements made by actuaries in a wider context. EIOPA 14/019 guidelines 2.337 suggest that having a well-defined process for choosing the appropriate validation tools allows knowledge about the tools to feedback through the validation cycle and ensure that tools are chosen consistently and appropriately. In the rest of this section, we look at how each of these tools may be used to validate expert judgements.

5.3.1. Testing the robustness of the internal model

Robustness includes identifying which expert judgements are most material and how credible an alternative view point could be. We expect that the validation will build on the assessment of materiality of the impact of the plausible range described in the process above. The validator may wish to check that the sensitivity testing is fit for the purpose of validation. They may also wish to examine the evidence to support making a different choice and form an opinion.

5.3.2. Testing results against experience

5.3.2.1. A scientific approach often relies on setting a hypothesis and testing the hypothesis against experience. We propose that expert judgement is considered in the same way. Testing the hypotheses underlying the expert judgement against experience focusses on assumptions made about the external environment, whereas profit and loss attribution tests assumptions on the impact that this experience has on the assets and liabilities within or internal to the insurer. Testing results against experience may be less helpful (without other assumptions) for judgements on methodology or where the focus is on "tail" events.

5.3.2.2. A key judgement by the validator is the granularity of this analysis. This may be at the broad level of the output from a sub-component of a model such as "expenses", "lapses" or "equity return". Alternatively, experience analysis may focus on the underlying symptoms or causes (e.g. poor service standard driving lapse experience) and how they are related to the assumptions on which the expert judgements are built.

5.3.3. Profit and loss attribution

5.3.3.1. Profit and loss attribution tests assumptions on the impact that this experience has on the assets and liabilities within or internal to the insurer, whereas testing against experience focusses on assumptions made about the external environment.

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5.3.3.2. Profit and loss attribution can inform the conversation between the validator and the firm on what factors are modelled, which are not and why. For example, a model design where, speaking loosely, the correlation between two factors is assumed to be constant in extreme and less extreme scenarios may be a result of an expert's views underlying an expert judgement, an accepted model limitation based either on a materiality assessment or which has been allowed for elsewhere in the model (e.g. through strengthening some correlation parameters) or it may be something that the firm has placed on the development plan for future iterations of the model. The validator may form a judgement on the specification of the model based on this understanding.

5.3.4. Stress and scenario testing

5.3.4.1. Stress and scenario testing can be considered to be a test of the assumptions made about the external macro environment and the assumptions within the asset-liability model describing how the insurer's financial position would react in the face of the stress/scenario test. This combines testing of experience and profit and loss attribution using a hypothetical situation rather than one which is necessarily grounded in the past. Stress and scenario testing events do not necessarily need to have a probability attached to them although this may help communication. Stress and scenario testing may also be mild – well within the experts' frame of reference – or extreme but still plausible. The validators may also review reverse stress testing results (i.e. identifying the scenarios which "break" the business).

5.3.4.2. Development of the scenario from the macro-environmental source of the shock can provide an alternative perspective on the assumptions on the root causes underlying the expert judgement. Comparing a macro-environmental scenario with the expert judgement can reveal inconsistencies in the expert judgements made on two or more different areas of the model. For example, an increase in expenses may be assumed to be partially driven by increases in inflation which in turn is accompanied by increases in long-term gilt rates. The risk of equity falls may be heightened if there is an extreme increase in long-term gilt rates but expenses may have been assumed to be unrelated to equity markets. The source of the inconsistency (which may be removed when a positive-semidefinite adjustment is made) may be in the way the expert(s) think about the problem or in different definitions of the problem. That is not to say that inconsistency in the model should be avoided at all costs, particularly if the expert has not got the frame of reference to provide advice on a conditional/unconditional basis, but it may help understanding and highlight a limitation.

5.3.4.3. Projection of the insurer's assets and liabilities in the face of the stress/scenario test can provide a test of the assumptions made in comparable areas of expert judgement. For example, one expert's view/mathematical model may assume that the financial position of the insurer remains static if investment returns are equal to the risk-free rate. A more sophisticated model that includes the impact of expected maturing and new business may show that the financial position will improve over time. The second model may be adjusted to be more like the first by assuming that maturities and new business form a stable population and the results compared.

5.3.5. Benchmarking

5.3.5.1. Benchmarking can be thought of as the introduction of alternative view points into the expert judgement process. Benchmarking may come from high-level statistics such as the median from an industry survey or in the models used by practitioners (such as estimating an implied property volatility parameter from historical experience or from current implied equity volatility observations) and intermediate assumptions (such as NHS funding in longevity projections) used to

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build expert judgement. The validation team have a role as bringing in ideas from external sources of expert judgements such as academic literature and industry/professional contacts as well as an understanding of the context in which benchmark expert judgements are made.

5.3.6. Simplified models

5.3.6.1. As discussed above, one of the benefits of having an independent validator is the ability to approach the same problem from a fresh perspective. By their nature, expert judgements are made by balancing a number of conflicting ideas and information. Fresh models do not need to be detailed or have the same explanatory power. Simplified models of potential thought processes can add insight to the validation activity.

5.3.7. Manual tracking of some internal model calculations

5.3.7.1. Judgement is often informed by a number of approximate calculations or rules of thumb. A sample of these calculations can be checked for reasonableness.

5.3.8. Peer review

5.3.8.1. Effective validation will also rely on the ability to critique the work of the firm's experts. The need for critique of the underlying sources of information was highlighted in our proposed expert judgement process in section 3. The validators' role is to critique the sources of information, logical steps and conclusions. There is a rich amount of literature in approaches and skills of critical appraisal. Brown & Keeley (2007) highlight that key steps in critical analysis include:

i. Identifying the issue and the conclusion.
ii. Identifying the reasons underlying the expert judgements.
iii. Where does ambiguity exist?
iv. What are the value conflicts and assumptions?
v. What are the descriptive assumptions?
vi. Are there any fallacies in the reasons?
vii. How good is the evidence?
viii. Are their rival causes?
ix. Are statistics deceptive?
x. What significant information is omitted?
xi. What other reasonable conclusions are possible?

These steps, and those used by other authors, are explained further in the literature on critical analysis.

5.3.8.2. The validators may wish to consider if expert judgement is appropriate for the methodology or assumptions, or whether a more quantitative approach might be more suitable (or vice versa).

5.3.8.3. Many actuarial assumptions are impacted by social systems. For example, longevity may be related to diet and medical advancement. Equity risk may be related to fear and greed in the market. As well as understanding if experience invalidates the principles underlying the expert judgements, where the expert judgement is based on a frame of reference of current market or macro-environmental conditions, the validator may wish to consider if that understanding of the macro-environmental conditions is still valid.

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5.4. Use of Expert Judgement Within Validation

5.4.1. The validation team will need to have considerable expertise themselves in order to engage effectively in a conversation with the firm's experts. They will need to have the depth of specialist knowledge to appreciate the arguments made by the firm, the breadth of specialist knowledge to understand alternative and external approaches and the quantitative and qualitative skills of the validation discipline itself.

5.4.2. A key judgement made by the validators is the action that should be taken if the firm's expert judgements fail a validation test; validation tests which are not capable of being failed are not valuable validation tests. The validators will need to agree a prioritisation of resolving failed validation tests and what the next steps should be.

5.4.3. A significant number of judgements need to be made by the validators, including aspects such as:

i. the effectiveness of the firm's expert judgement process;
ii. identifying the key assumptions made by the firm's experts and which tools/information can be used to test those assumptions;
iii. prior beliefs on what the results from sensitivity, stress and scenario tests should look like;
iv. what is a reasonable range of the results from validation;
v. the appropriateness of the chain of logic used by the firm's experts;
vi. identifying the root causes of past experience;
vii. interpretation of statistical tests;
viii. the balance between accuracy and parsimony of the model;
ix. development of relevant and extreme but plausible stress and scenarios; and
x. relevance and context of external benchmarking approaches.

6. Practical Considerations

6.1. Tools to Manage Expert Judgement Governance

6.1.1. Expert judgement process guidelines

Firms should define guidelines for the process of development and use of expert judgement. This could cover aspects such as:

i. Identifying when and why expert judgement is required.
ii. Required practice for eliciting expert judgements in various scenarios, for example, direct consultation with single experts, the use of multiple experts, the use of certain elicitation techniques (e.g. the Nominal Group technique, the Delphi technique, etc.).
iii. Requirements in relation to the all-important contextual information – including sufficient background and intended use – to be supplied to the expert to allow him or her to provide judgement effectively.
iv. The required approach to internal review, challenge and sign-off.
v. The required approach to feeding back the use of the judgement.
vi. The required process for reporting and escalation.

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A documented and validated policy will help to bring consistency to the use of expert judgement, both across different areas within the firm and over time.

6.1.2. Expert judgement register

6.1.2.1. We believe that an expert judgement register would be very useful tool in the management of expert judgement within a firm. This would effectively be a log of all expert judgements relevant to the particular context, for example, an insurer's Solvency II internal model.

6.1.2.2. The contents of the register will vary, but may contain aspects such as:

i. a unique reference number;
ii. a category into which the judgement falls – to be used for grouping and reporting purposes;
iii. a description of the judgement;
iv. the key drivers underlying the judgement;
v. a measure of the materiality of the judgement;
vi. a measure of the firm's tolerance to the particular expert judgement;
vii. links to the location of all of the relevant documentation;
viii. the names of the experts and their qualifications;
ix. the date at which the judgement applies;
x. the scheduled review date;
xi. triggers and trigger levels, which if breached, require the judgement to be reviewed;
xii. the way in which the judgement is used (e.g. accepted, altered, rejected) and reasons;
xiii. dates of meetings to feedback to the expert on how his/her judgement was used, and links to meeting notes and papers;
xiv. the senior-level executive "sponsor" with ultimate responsibility; and
xv. the day-to-day owner.

6.1.2.3. The benefits of a comprehensive register are clear, and include the following:

i. it brings together all areas of expert judgement in one place;
ii. it allows expert judgements to be summarised, shared and reported;
iii. it facilitates consistency across expert judgements in related areas; and
iv. for those firms with an articulated expert judgement tolerance, it allows the position against the stated tolerance levels to be assessed and reported on, enabling areas where remedial action is required to be identified, prioritised and agreed.

6.2. Documentation Standards

6.2.1. Expert judgements should be documented in a clear and consistent way. One way to do this would be for a firm to develop appropriate documentation templates. This might by through the use of separate templates for expert judgements, but our experience is that building expert judgement sections into the firm's standard documentation templates is a really effective way of ensuring this happens.

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6.2.2. As outlined in section 3, the documentation around expert judgements should capture the key thought processes leading up to the decision. This should have a logical structure and include the following aspects:

i. the information sources used, including the names of the experts;
ii. the relative importance attached to each information source and rationale;
iii. the thought processes leading to the decision;
iv. a statement of the decision;
v. the assessed plausible range around the decision including rationale;
vi. the impact of that plausible range on the output metrics;
vii. the date for the next scheduled review of the decision;
viii. the triggers for non-scheduled review; and
ix. validation performed on the decision.

6.2.3. The briefing document sent to the experts will be an important element of the documentation.

6.2.4. Completion of the documentation should be mandatory, and subject to internal review to ensure completeness and consistency.

6.3. Management Board Reporting

6.3.1. The Board needs to be able to rely on the governance around expert judgement. Although the Board has overall responsibility in signing off the expert judgement policy, we would propose that this is further embedded by incorporating expert judgement into the terms of reference of the appropriate Board committee or sub-committee. This ensures that the tone is set from the top.

6.3.2. It may be sensible to appoint executive sponsors and operational owners, with responsibility for ensuring that expert judgements are tracked and reported on. Again these should be formalised into performance objectives. It may ultimately be sensible to create an Expert Judgement Manager role to look after this throughout the business.

6.3.3. Tracking expert judgement through time can be a very powerful tool, answering questions such as:

- Is the importance of expert judgement becoming greater, or is it lessening?
- Are there adverse trends?
- What can be done to reverse those trends?

6.3.4. Expert judgement often has a very significant impact on key output metrics of the firm. It is therefore important that appropriate expert judgement MI is reported to the Board on a regular basis.

6.4. Benchmarking/Knowledge Sharing

6.4.1. Where possible, benchmark the significance, use and application of expert judgement. Be open to sharing knowledge with peers, both within the firm and with other firms. Where this is not desirable for confidentiality reasons, firms should consider using an external consultant to help in this area.

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6.5. Cultural considerations

6.5.1. While less tangible than some of the concepts presented so far, and certainly less homogeneous across different firms, the importance of embracing expert judgement within the firm's culture shouldn't be overlooked.

6.5.2. Keep it fresh

6.5.2.1. Rotate responsibilities within the firm, both at executive and operational owner level. This will help to ensure the firm does not become too entrenched in its position and "blind" to alternatives. Use different experts – or even seek the opinion of multiple experts – where this is possible.

6.5.3. Keep it focussed

6.5.3.1 Keep an eye on the expert judgement plausible ranges. With limited budgets to spend, a measure of materiality should be used to focus efforts on the areas where greatest clarity is needed and to investigate what can be done to elicit that clarity. Expert judgements outside of tolerance would be a key focus.

6.5.4. Be humble and recognise your limitations

6.5.4.1 By its nature, the 'correct' answer is unknown – possibly even unknowable – and to think otherwise is potentially very dangerous indeed. While it may seem obvious, it is important to keep this front of mind to ensure that complacency – in the form of passive acceptance of established expert judgements – doesn't set in.

References

Brown, M.B. & Keeley, S.M. (2007). *Asking the Right Questions – A Guide to Critical Thinking*, 8th ed. New Jersey: Pearson Hall.

Continuous Mortality Investigation (CMI). (2013). CMI library of mortality projections, available at http://www.actuaries.org.uk/research-and-resources/pages/cmi-library-mortality-projections (accessed 18 December 2013).

Continuous Mortality Investigation (CMI). (2014). CMI Working Paper No. 74, Continuous Mortality Investigation, s.l.

Cooke, R.M. & Gossans, L.H.J. (1999). *Procedures Guide for Structured Expert Judgement*. Delft, Delft University of Technology.

https://doi.org/10.1017/S1357321715000239 Published online by Cambridge University Press

EIOPA (2014a). Guidelines on valuation of technical provisions, Final Report on Public Consultation No. 14/036, EIOPA, s.l.
EIOPA (2014b). Guidelines on Solvency II relating to Pillar 1 requirements, consultation paper, EIOPA, s.l.
EIOPA (2014c). Guidelines on the use of internal models, Final Report on Public Consultation No. 14/019EIOPA, s.l.
EIOPA (2014d). Guidelines on application of outwards reinsurance arrangements to the non-life underwriting risk sub-module, Final Report on Public Consultation No. 14/036, EIOPA, s.l.
EIOPA (2014e). Guidelines on health catastrophe risk sub-module, Final Report on Public Consultation No. 14/036, , EIOPA, s.l.
EIOPA (2014f). Guidelines on undertaking-specific parameters, Final Report on Public Consultation No. 14/036, EIOPA, s.l.
Frankland, R. *et al*. (2013). Difficult risks and capital models – a discussion paper. *British Actuarial Journal*, **19**(3), 556–616.
FRC, Board for Actuarial Standards (2009). *Technical Actuarial Standard R: Reporting Actuarial Information*. s.l., FRC, Board for Actuarial Standards.
Leonard, D. & Swap, W. (2005). *Deep Smarts: How to Cultivate and Transfer Enduring Business Wisdom*. s.l.: Harvard Business School Press.
Nonaka, I. & Takeuchi, H. (1995). *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*, 1st ed. USA: OUP.
Official Journal of the European Union. (2009). Directive 2009/138/EC of the European Parliament and of the Council.
Official Journal of the European Union. (2015). Supplementing Directive 2009/138/EC of the European Parliament and of the Council on the Commission Delegated Regulation (EU) 2015/35.
Prudential Regulation Authority (PRA). (2013). Solvency II: applying EIOPA's preparatory guidelines to PRA-authorised firms, PRA, s.l.

Appendix 1. Solvency II Regulations: Expert Judgement

1.1 Overview

1.1.1. Solvency II is a risk-based regulatory framework for the supervision of insurance organisations operating in the European Union, which comes into effect on 1 January 2016. Solvency II will replace Solvency I and the Insurance Groups Directive, and will result in changes to the current Prudential Regulation Authority (PRA) supervisory regime, including Individual Capital Adequacy Standards.

1.1.2. Solvency II is based on three pillars:

1. Pillar 1 covers risk measurement, that is, the valuation of assets and liabilities and the calculation of capital requirements. The calculation of the capital requirements can be performed either using a Standard Formula approach or, subject to regulatory approval, by using an Internal Model.
2. Pillar 2 covers risk management, and includes the requirement for an Own Risk and Solvency Assessment (ORSA).
3. Pillar 3 covers supervisory reporting and public disclosures.

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1.1.3. There are different levels of Solvency II regulation:

i. The Level 1 Directive (as amended by the Omnibus II Directive) sets out the framework and principles. There are no specific references to expert judgement in the Directive(*Official Journal of the European Union*, 2009).
ii. The Level 2 Delegated Acts set out the operational detail of the Level 1 Directive. Supporting the Delegated Acts are Implementing and Regulatory Technical Standards (ITSs and RTSs). The final Level 2 Delegated Acts were published in October 2014, appearing in the *Official Journal of the European Union* on 17 January 2015 (*Official Journal of the European Union*, 2015). At the time of writing, the Technical Standards are currently being finalised.
iii. Level 3 Guidelines set out additional detail on the expectations of the supervisors in relation to the application of the Directive, Delegated Acts, ITSs and RTSs. Unlike the Level 1 Directive and Level 2 Delegated Acts, the Level 3 guidelines are not legally binding. At the time of writing, the Level 3 Guidelines are not yet final.

The expert judgement requirements in the Level 2 Delegated Acts and Level 3 Guidelines are set out in the remainder of this section.

1.2. Solvency II Level 2 Delegated Acts: Article 2

1.2.1. Article 2 of the Level 2 Delegated Acts requires firms to choose assumptions relating to the valuation of assets and liabilities, technical provisions, own funds, SCR, minimum capital requirement and investment rules "based on the expertise of persons with relevant knowledge, experience and understanding of the risks inherent in the insurance or reinsurance business".

The Article goes on to advise that internal users of the assumptions are informed, in a proportionate way, about the assumptions' relevant content, degree of reliability and limitations.

1.2.2. It is important to recognise that the scope of expert judgement in Article 2 is more than the Internal Model used to calculate the SCR. Expert judgement is also relevant to the calculation of the balance sheet to determine the assets available to cover capital requirements and so applies to Standard Formula firms as well.

1.3. Solvency II Pillar I Level 3 Guidance on Expert Judgement

1.3.1. In June 2014, EIOPA consulted on Set 1 of the Level 3 Guidelines for Solvency II. Chapter 4 of the final report on Internal Models relates to "assumption setting and expert judgement" (EIOPA, 2014c).

EIOPA advises in a cover note to the June 2014 consultation that the Guidelines apply in a consistent manner to all firms, not just those using an internal model and as such the Guidelines relating to expert judgement in the Internal Model consultation also apply to the consultations on the valuation of assets and liabilities other than technical provisions, as well as the valuation of technical provisions, which reinforces the statement made earlier in this section.

It is further noted that the Guidelines on expert judgement also apply to committees, if the committee provides assumptions based on expert judgement.

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1.3.1.1. The five guidelines in Chapter 4 of EIOPA's final report on Internal Models with regard to assumption setting and expert judgement are:

i. *Materiality (Guideline 16)*: Firms should consider the materiality of the impact of expert judgement when setting assumptions and using expert judgement. The materiality should be assessed using both quantitative (such as capital, technical provisions) and qualitative indicators, and also consider the materiality under stressed conditions.

ii. *Governance (Guideline 17)*: A validated and documented process should be followed when setting assumptions and using expert judgement. Firms should ensure that assumptions/expert judgements are derived and used consistently over time, as well as consistently across the whole of the firm. In addition, firms should ensure that the assumptions/expert judgements are fit for their intended use. All assumptions/expert judgements should be signed off at a level within the firm appropriate to the materiality of the assumption.
Our view is that following a defined process will help to ensure that expert judgements are derived and used consistently over time, which is also a requirement of the Guideline. A process also assists in validating the expert judgement in that validation can occur on each of the steps to determine the expert judgement, as well as on the resulting assumption.
We propose a process which could be used for expert judgement in section 3 of our paper, and provide an example of the process in section 4.

iii. *Communication and uncertainty (Guideline 18)*: The process for setting assumptions that require expert judgement should include a formal and documented feedback loop between the assumption setters and the assumption users. The feedback loop is to mitigate the risk of misunderstanding or misusing the expert judgement.
The uncertainty of the expert judgement should be clearly documented, both qualitatively and quantitatively, for example, providing a plausible range as referred to in section 3.2.2 below. This is also a requirement of the TAS for Reporting Actuarial Information (refer to sections C.5.2 to C.5.4 of TAS R (FRC, Board for Actuarial Standards, 2009)).
A description of the feedback loop is set out in process section 3.5.11.

iv. *Documentation (Guideline 19)*: The resulting assumptions/expert judgements and their materiality, the experts involved in deriving the assumptions, the intended use and the period of validity of the assumption/expert judgement should be included in the documentation.
The documentation should set out the rationale for the opinion and include sufficient detail for the assumption setting/expert judgement to be transparent.
Documentation is very important to expert judgement: as well as this Guideline, Guidelines 17 and 18 above require that the process and feedback loop are documented and Guideline 20 below expects the results of the validation to be documented.
Additional explanatory text to Guideline 19 in the consultation papers highlighted the documentation needs to clarify:

a. How and what kind of expert judgement is involved in choosing the assumption?;

b. materiality of the expert judgement;

c. the context of the use of expert judgement, if not evident;

d. why an assumption is required, if not evident;

e. evidence for the expertise of the individuals or group making the assumption/judgement;

f. the rationale for the assumption, including the "information basis used", which could include:

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- inputs, interpretations and hypotheses on which the assumption is based, as well as how the expert judgement has been used;
- outputs and any relevant shortcomings and uncertainty surrounding them, where relevant, including references to alternative assumptions; and
- processes and methods for deriving the assumption.

v. *Validation (Guideline 20)*: Firms should ensure the process for choosing assumptions and using expert judgements is validated, and that the process/tools used for validation are documented. An important tool for validation is tracking the assumptions against actual experience and new information. Other tools such as peer review, stress testing or sensitivity testing should also be used. Assumptions should be peer reviewed, and the circumstances identified under which the assumptions would be considered false.

1.3.1.2. In addition to the Guidelines in Chapter 4 of the final report on Internal Models, Guidelines 27 and 42 in that report refer to expert judgement:

i. Guideline 27 relates to the Statistical Quality standard and specifically "probability distribution forecast enrichment". The Guideline requires firms to ensure that any expert judgement applied in enriching the probability distribution forecasts takes into account the Guidelines in Chapter 4.
ii. Guideline 42 relates to the Validation standard and specifically that firms should "ensure that the selected data and expert judgement used in the validation process effectively allows it to validate the internal model under a wide range of circumstances that have occurred in the past or could potentially occur in the future".

1.3.2. In June 2014, EIOPA consulted on the Guidelines on Solvency II relating to Pillar 1 requirements, No. 14/036 (EIOPA, 2014b). The final reports following that consultation where expert judgement is referenced are Guidelines on:

i. valuation of technical provisions, EIOPA-BoS-14/166 (EIOPA, 2014a);
ii. application of outwards reinsurance arrangements to the non-life underwriting risk sub-module, EIOPA-BoS-14/173 (EIOPA, 2014d);
iii. undertaking specific parameters (USPs), EIOPA-BoS-14/178 (EIOPA, 2014f); and
iv. health catastrophe risk sub-module, EIOPA-BoS-14/176 (EIOPA, 2014e).

1.3.2.1. Valuation of technical provisions. The final report reiterates that expert judgement is a key component of the calculation of technical provisions, and that the Guidelines should be read in conjunction with Chapter 4 of the Internal Model Guidelines (as set out in section 1.2 above). In addition, the following Guidelines refer to expert judgement:

i. Guideline 7 requires firms to "ensure that the use of expert judgement in assessing accurate, appropriate and complete data for use in the calculation of technical provisions does not replace the appropriate collection, processing and analysis of data but supplements these where required".
ii. Where there are material limitations to data, Guideline 13 requires that expert judgement is applied to ensure that the technical provisions are appropriately calculated. Similarly, the explanatory text to Guideline 11 (rather than the Guideline itself) advises that the actuarial function should use appropriate approximations, which "may imply the use of assumptions relying on expert judgement" where data are deficient.

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iii. Guideline 25 specifically requires firms when assessing the level of correlation between biometric risk factors to base that assessment on historical data and expert judgement using Chapter 4 of the Internal Model Guidelines.

iv. Guideline 82 relates to general principles in respect of the methodologies to calculate technical provisions. The explanatory text to this Guideline highlights that expert judgement can be applied when determining the method of calculation, and also provides an example that "expert judgement in respect of assumptions on segmentation may be based on deep knowledge of statutory and regulatory terms, contractual terms (including options and guarantees included in the contracts) and reasonable policyholder expectations".

1.3.2.2. Outward reinsurance to non-life underwriting. In the explanatory text to Guideline 2 of the final report on the application of outwards reinsurance arrangements to the non-life underwriting risk sub-module, "it is recognised that the generation of catastrophe events will rely on a significant element of expert judgement and it is expected the generation and suitable challenge of events will include involvement of the relevant experts within the undertaking, e.g. experts that understand:

(i) the underlying exposures,

(ii) potential for claims,

(iii) context of the current market environment, and

(iv) the details of the risk mitigation techniques available".

1.3.2.3. USPs. Guideline 1 relates to the role of expert judgement when determining Undertaking Specific Parameters (USPs). Firms should only use expert judgement where data has limitations. Expert judgement must not be used as a substitute for missing data.

The explanatory text to Guideline 4 advises that expert judgement may be used when specifying criteria relating to catastrophe events.

1.3.2.4. Health catastrophe. Guidelines 5 and 8 refer to the application of expert judgement in relation to the calculation of the sum insured for medical treatment caused by accident and the calculation of the best estimate of medical expense amounts, respectively.

1.4. Other Solvency II Level 3 Guidance on Expert Judgement

1.4.1. The Actuarial Function has specific responsibilities in relation to expert judgement that were detailed in EIOPA's pre-consultation proposal for Level 3 Guidelines on Actuarial Function responsibilities, which was issued in October 2011. The Actuarial Function's main responsibilities under Solvency II relate to the calculation of technical provisions and so the expert judgement requirements primarily relate to judgements applied in the calculation of technical provisions. The rules in relation to the calculation of technical provisions are set out in Articles 76–85 of the Directive and are supported by the Level 2 Delegated Acts, as detailed in Article 86 of the Directive, and the Level 3 Guidelines referred to in section 1.3 above.

1.4.2. The Level 3 Guidelines in relation to the Actuarial Function proposed:

i. In relation to data used in the calculation:

   a. Approximations may be used which may imply expert judgement or the setting of assumptions to the data to allow valuation of technical provisions (also referenced in Guideline 11 of valuation of technical provisions).

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b. Ensure expert judgement does not replace appropriate collection, processing and analysis of data, but rather should supplement it (also referenced in Guideline 7 of valuation of technical provisions).

c. Material limitations of data which cannot be overcome without undue complexity should have expert judgement applied to overcome the limitations (also referenced in Guideline 13 of valuation of technical provisions).

d. Expert judgement should be based on careful analysis, including a comparison to other relevant sources of information as well as to the reliability of data as a basis for making assumptions.

ii. In relation to the required comparison of best estimates against actual experience, if systematic deviations are observed, expert judgement should be applied to the assumptions being made or the methodologies to ensure the appropriate calculation of technical provisions.

iii. There is a general requirement for the Actuarial Function to ensure that the overarching requirements regarding expert judgement set out in Article 2 of the Level 2 Delegated Acts are followed.

It is not entirely clear if the consultation on the Level 3 Guidelines on the Actuarial Function has been fully replaced with the final report on the Guidelines on the Valuation of the technical provisions referred to in section 1.3 above.

1.4.3. Some of the Actuarial Function responsibilities have also been included in EIOPA's Preparatory Guidelines to National Competent Authorities (NCAs) e.g. the PRA in the UK. The EIOPA Guidelines are supported by the PRA's Supervisory Statement SS4/13, which came into effect on 1 January 2014 (PRA, 2013). During the preparatory period "firms should read, assess and implement the substantive provisions of the guidelines". The Guidelines are separated into four areas:

a. system of governance;

b. forward-looking assessment of own risks;

c. submission of information to NCAs; and

d. pre-application for Internal Models.

Guidelines 38–43 of the system of governance relate to the Actuarial Function and Guidelines 39 and 40 relate to the calculation of technical provisions and data quality:

i. Guideline 39 requires "the Actuarial Function to identify any inconsistency with the requirements set out in Articles 76 to Article 85 of Solvency II Directive for the calculation of technical provisions and propose corrections as appropriate".

ii. Guideline 40 requires "the Actuarial Function to assess the consistency of the internal and external data used in the calculation of technical provisions against the data quality standards as set in Solvency II Directive. Where relevant, the Actuarial Function provides recommendations on internal procedures to improve data quality so as to ensure that the undertaking is in a position to comply with the related Solvency II requirement when implemented".

Although expert judgement is not directly referenced, to be able to meet the Actuarial Function responsibilities will require consideration of the expert judgements applied in the calculation of the technical provisions, including expert judgements applied to the data used in those calculations to address any limitations.

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1.4.4. In addition to the system of governance, there are a number of Guidelines within the pre-application for internal models which relate to expert judgement:

i. Chapter 4 sets out five Guidelines for "assumption setting and expert judgement". The Guidelines cover: assumption setting (Guideline 18); governance (Guideline 19); communication and uncertainty (Guideline 20); documentation (Guideline 21) and validation (Guideline 22).

ii. Guideline 29 relates to the setting of the probability distribution forecast and the expert judgement used in doing so.

iii. Guideline 50 relates to the validation of data sets and makes reference to expert judgement.

These guidelines for NCAs are consistent with the Guidelines in section 1.3.1.1 and 1.3.1.2 above.

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