International Actuarial Association
Association Actuarielle Internationale

International Actuarial Note 300

Professional Judgement

Exposure Draft

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This International Actuarial Note (IAN) is promulgated under the authority of the International Actuarial Association. It is an educational document on an actuarial subject that has been adopted by the IAA in order to advance the understanding of the subject by readers of the IAN, including actuaries and others, who use or rely upon the work of actuaries. It is not an International Standard of Actuarial Practice ("ISAP") and is not intended to convey in any manner that it is authoritative guidance.

IAN 300
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An International Actuarial Note (IAN) is an educational document that provides information on current or emerging practices in relation to an international actuarial topic. It serves to familiarize actuaries with approaches that might be taken and to demonstrate how the actuarial profession might approach the topic. The major difference between an IAN and other IAA educational documents is that all IAA Member Associations must be invited to provide input to the IAN through a formal consultation process, which maximises the capacity to identify any material differences of opinion on the content of the IAN.

An IAN does not impose any obligation on any IAA Member Association or any individual actuary to promote or apply the practices described. It is not a definitive statement as to what constitutes generally accepted practice in the area under discussion and the language used is not directive.

An IAN may address a topic that is also addressed by an International Standard of Actuarial Practice (ISAP) issued by the IAA. In that case, the IAN will not conflict with the ISAP. **The IAN does not seek to interpret the ISAP, and it is not intended as a description of how an IAA Member Association might interpret the ISAP**. Nor is it intended as a description of how an actuary might apply the ISAP or any actuarial standard based on the ISAP, though it might assist in that regard.

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1. INTRODUCTION

1.1. DUE PROCESS OF THIS PAPER

An International Actuarial Note (IAN) is an educational document that provides information on current or emerging practices in relation to an international actuarial topic. It serves to familiarize actuaries with approaches that might be taken and to demonstrate how the actuarial profession might approach the topic. The major difference between an IAN and other International Actuarial Association (IAA) educational documents is that all IAA Member Associations must be invited to provide input to the IAN through a formal consultation process, which maximises the capacity to identify any material differences of opinion on the content of the IAN.

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An IAN is not prescriptive and therefore does not contain words such as “should” or “must” unless such usage is justified for the purpose of this IAN. Rather, an IAN is descriptive and usually conveys its content by the use of examples of actual practice, without suggesting that any of these examples would be expected to be used or that these examples are comprehensive. The language of an IAN is more prescriptive if reference is made to one of the International Standards of Actuarial Practice (ISAP)[1], in particular to ISAP 1.

1.2. THIS IAN IS ON PROFESSIONAL JUDGMENT

This IAN is an educational document on professional judgment performed by an actuary or by any other actuarial expert who would apply judgments that are considered professional.

The field of work for actuaries has been broadening over the past years. In addition to their traditional roles in insurance and pensions, both in private and public fields, actuaries nowadays are professionals in high demand in many industries as experts in risk assessment and risk management. Furthermore, the nature of many services provided by actuaries (for example, reporting under various accounting frameworks or capital standards) has changed from “rules-based” to “principles-based” approach with the latter often requiring judgment. Hence, it is relevant to work out the unique characteristics of actuarial professional judgment.

Expert judgment is based on specific training, knowledge, experience and expertise. Professional judgment, however, is based not only on the same requirements, but also on standards of professionalism including the Code of Professional Conduct. The Code of Professional Conduct sets the standard of behaviour for the professionals and creates

[1] Note, however, that ISAPs are not binding on any actuary. An ISAP is applicable on an actuary if it is promulgated by the relevant standard setter; it is binding on an actuary if the relevant standard setter categorized it as an obligatory standard.

accountability to both the public and the professional body, thereby setting professional judgment apart from expert judgment.

1.3. PURPOSE AND TARGET AUDIENCE

Actuaries work in different fields of actuarial practice and in different roles. The specificities of the particular role require an appropriate use of these principles and an adaptation to the particular task.

Actuaries apply professional judgment in their daily actuarial activities such as:

- The choice of data for an assignment.
- How to deal with missing or inappropriate data.
- The selection and usage of the methodology and the model.
- The setting of key assumptions embedded in the model.
- The interpretation of the model outcome.
- Communicating and documenting their work.

While the principles remain the same, the application and adaptation may vary depending on the actuaries' role and the specific task.

To provide support in this regard, this IAN will continue to be extended by means of additional appendices dealing with the specificities in different fields of actuarial practice

1.4. LIST OF ABBREVIATIONS USED

AI	Artificial Intelligence
EAN	European Actuarial Note
FMA	Full Member Association of the IAA
GDPR	General Data Protection Regulation (European)
IAA	International Actuarial Association
IAN	International Actuarial Note
IAS	International Accounting Standard
ICP	Insurance Core Principle
IFRS	International Financial Reporting Standard
IORP	Institutions for Occupational Retirement Provision
ISAP	International Standard of Actuarial Practice of the IAA
IT	Information Technology

2. BACKGROUND AND STANDARDS

2.1. GENERAL

An actuary's opinion fundamentally relies on the actuary's professional judgment.

To be able to serve the public interest, as well as the Intended Users,[2] the actuarial profession has established a framework by combining basic educational requirements, standards of actuarial practice, continuous professional development and an ethical code (Code of Professional Conduct). Expert judgment is based on specific training, knowledge, experience and expertise. Professional judgment, however, is based not only on the same requirements, but also on standards of professionalism including the Code of Professional Conduct. Actuarial judgment is professional judgment applied by actuaries. Actuaries are bound by professional and ethical standards to develop an opinion or decision based upon professional judgment about what should be done to best serve the intended user of the opinion or decision.

In their daily work, actuaries are involved in processes requiring their professional judgment. Predictive modelling and problem solving are underpinned by the professional judgment of the actuary assessing the quality and usability of all facets needed to substantiate their advice. Among these the quality and appropriateness of data, the appropriateness of methods, assumptions, and parameters, the suitability of models, and the way the results are communicated are crucial. A good understanding of business, finance, economics, and current events can help actuaries make informed decisions. This includes understanding the broader implications of the actuary's work.

The need for a professional judgment is increasing and is pervasive in all actuarial tasks. Progress in science, technical innovation, changing and upcoming risks and laws/regulations affect the daily life of society and impact the work of actuaries. Actuaries may consider relevant aspects of these developments in their professional work. Actuarial associations review and adapt training and educational standards regularly to keep pace with these developments. In addition, new regulations and standards tend to be more "principles-based" than past "rules-based" regulations/standards. The more principles based a regulation, the more important is the need for professional judgment. Some examples include:

- Considering macroeconomic risks or the use of artificial intelligence in insurance pricing or reserving or a quantitative assessment of a pension or employee benefit plan.
- The explicit role of the Actuarial Function within accounting or supervisory frameworks (Solvency II-Directive, IORP-Directives, ICP-Insurance Core Principles – CP 7, etc.).
- Actuaries providing services to reporting under IAS 19 Employee Benefits have for long applied professional judgment when setting or proposing relevant assumptions.
- Accounting standard IFRS 17 Insurance Contracts requires the preparer to apply judgment and actuaries will be in the forefront of preparing the financial statements.
- New and complex risks require a thorough analysis and the choice of appropriate models to consider all relevant aspects comprehensively.
    - The increasing use of Data Science and Artificial Intelligence tools and methods strengthen the need for professional judgment to assure the adequacy and the reliability of the results.

[2] Defined in the ISAP Glossary to be any legal or natural person (usually including the principal) whom the actuary intends to use the output of the actuarial services at the time the actuary performs those services.

Professional judgment affects the outcome of actuarial considerations and calculations, and influences the decisions of the user of the actuarial services. To enable replication or a future traceability, it may be appropriate to document relevant steps and assumptions underlying the judgment.

i. The exercise of judgment is not clear-cut, except perhaps in hindsight. A judgment that is reasonable at its making may still lead to poor outcomes.

ii. A judgment that is completely subjective would not be reasonable even though it may be based on honest belief. A reasonable judgment would be based on a justifiable process and data set, and demonstrably take into account the relevant code of professional conduct, standards of practice, common sense, and constraints on time and resources.

Because of the importance of judgment, it seems to be necessary to elaborate first on what professional judgment means. What is the essence of professional judgment? What distinguishes professional judgment from other expert judgments?

2.2. PROFESSIONALISM

When providing professional judgment, the actuary cannot solely rely on their expert knowledge. The Codes of Professional Conduct of all FMAs and the ISAPs require compliance with the principles of professionalism including the principles of professional conduct.

Definitions or classifications of actuarial professionalism can be found in published standards of actuarial practice, in IAA publications or in the Code of Professional Conduct of all FMAs.

Actuarial Professional Judgment is the expert judgment of the actuary based on actuarial training and experience that is also bound by professional standards, laws and ethical principles.

Professionalism, for the actuarial profession, means

- *the application of specialist actuarial knowledge and expertise;*
- *the demonstration of ethical behaviour, especially in doing actuarial work; and*
- *the actuary's accountability to a professional actuarial association or similar professional oversight organisation on the basis of a code of conduct.*

The principles of professionalism[3] expects the actuary to act in the following manner:

- **Knowledge and expertise**: An actuary shall perform professional services only if the actuary is competent and appropriately experienced to do so.
- **Values and behaviour**: An actuary shall act honestly, with integrity and competence, and in a manner that fulfils the profession's responsibility to the public and upholds the reputation of the actuarial profession.
- **Professional accountability**: An actuary shall be accountable to a professional actuarial association or a similar professional oversight organisation.

2.3. CODE OF PROFESSIONAL CONDUCT

[3] IAA PG1 -Principles of Professionalism (2017)
https://www.actuaries.org/CTTEES_PROFESS/Papers/Professionalism_Guidelines/PG1_Principles_of_Professionalism_07102017.pdf

The following professionalism principles for the work of an actuary are part of any Code of Professional Conduct.[4]

- **Integrity**: An actuary must act honestly and with the highest standards of integrity.
- **Competence and Care**: An actuary must perform professional services competently and with care.
- **Compliance**: An actuary must comply with all relevant legal, regulatory and professional requirements.
- **Impartiality**: An actuary must not allow bias, conflict of interest or the undue influence of others to override professional judgment.
- **Communication**: An actuary must communicate in an appropriate manner and meet all applicable reporting standards

An actuary can be held accountable by their local actuarial professional association if they do not meet the Code of Professional Conduct.

3. DUTIES OF AN ACTUARY WHEN MAKING PROFESSIONAL JUDGMENT

Actuaries are mainly focussed on forecasting future performance, using past and current events as input data, and considering potential future probability-weighted scenarios.

An actuary who is a member of a Full Member Association of the IAA must abide by the Code of Professional Conduct issued by their local association that is consistent with the professional principles as set out in IAA Internal Regulation 2.2.2.

The self-assessment questions are a starting point intended to help the actuary decide on the soundness of their professional judgment or if there was any impairment. The questions are structured in accordance with the five professionalism principles that are within all Codes of Professional Conduct (i.e., integrity, competence and care, compliance, impartiality and communication).[5] The local Code of Professional Conduct that is applicable to an individual actuary may be structured differently, however the five principles will all be present.

3.1. INTEGRITY

- Can I devote enough time and resources to perform the assignment?
- Might the assignment contravene my ethical and/or moral principles?

3.2. COMPETENCE AND CARE

- Do I have the knowledge and experience required to deal with the issues involved in the assignment?

[4] The IAA requires its Full Member Associations' Codes of Conduct to be consistent with the professional principles as set out in IAA Internal Regulation 2.2.2 (a).
[5] See the IAA Internal Regulations 2.2.2(a). This requires – among other things – actuaries to act with integrity, skill and care; not to disclose confidential information; to act only if competent and experienced; to conform to the practice standards of their local profession; and not to act where there is an unresolved conflict of interest that may impair their judgment.

- Do I have access to other knowledgeable / experienced professionals where needed and am I willing to use these professionals?

3.3. COMPLIANCE

- Does the completion of the assignment contravene any regulation or professional standard?

3.4. IMPARTIALITY

- Can I avoid undue pressure from any involved party to influence the result of the assignment? Have I disclosed actual or potential conflicts of interest to all involved parties?
- Could the compensation for the assignment create bias in my judgment? Am I prepared to disclose to the parties all sources of income received in relation to the assignment?
- Can I assure that I can keep professional scepticism[6] towards data and any other piece of information provided by any party involved in the assignment?

3.5. COMMUNICATION

- Can I communicate efficiently and clearly the outcome of the assignment under any circumstance or in any forum (say, in front of my principal, an individual customer, a board of directors, a press conference or, in particular, in front of a court)?

These questions may help evaluate if there is a risk that the actuary's professional judgment may become impaired. If any answer reveals serious obstacles for the actuary to achieve integrity, competence, compliance, impartiality, and appropriately communicated professional judgment, they may consider several courses of action:

- Clearly express the factors that may hinder the actuary's professional judgment.
- Communicate to the parties with a vested interest the setbacks that affect the actuary's professional judgment.
- Consider abandoning the assignment if it contravenes any principle of the Code of Professional Conduct.

Once the presence of any factors that can negatively affect the performance of the actuary has been assessed and mitigated, consideration can be given to the application of professional judgment to data, methods and models, assumptions in models, the interpretation of outcomes, and conclusions of the assignment.

The self-assessment questions can be expanded to apply to all matters of professional judgment. This way the actuary could decide whether, while duly considering materiality aspects, they are appropriately applying their professional judgment.

4. DATA

Data constitute the basis for all quantitative actuarial work. The quality of the data is crucial because models and assumptions are developed and validated based on data. An

[6] **Professional scepticism**: Attitude that includes an inquisitive mindset, special attention to circumstances that may be indicative of possible inaccuracies, and a critical assessment of the evidence.

assessment of this quality is an important step for the actuary.[7] The quality and completeness of the available data sources for the particular task, are likely to be analysed. In case of non-completeness, it might be necessary to find an appropriate treatment of missing or incomplete data.

The use of professional judgment by actuaries in assessing accurate, appropriate, and sufficient data for their assignment may not replace the appropriate collection, processing and analysis of data. Rather, it may supplement these actions where required.

The following paragraphs provide a list of questions and principles that might help to check the quality of the data as described in ISAP 1 (2018) 2.5 Data Quality.

4.1. ASSESSING DATA SOURCES

- Are data sources for the assignment relevant, sufficient, and reliable? (If not, see section 4.4 below for further assessment.)
  - Can I check the soundness of any data source?
  - Do I suspect there might be any vested interest or bias involved in a particular data source?
- Are data and scenarios which may be used for the assessment of risks relevant, sufficient, and reliable?
  - Can I check the soundness of any provider or model used to generate the data or scenarios (in case of pre-processed data)?
  - Can I check and assess the underlying assumptions in the model used to generate the data or scenarios?
  - Can I assess the suitability of data or scenarios for my assignment?
- Are the data internally consistent and complete? (If not, see section 4.3 below for further assessment.)
  - Do I need to proactively run a comprehensive data consistency check or look for any individual mistakes in the data and do I need to run a data cleansing exercise?
  - Do I have a good understanding of the meaning of each data entry and how it may have changed over time?
  - Is the data collected in a way to prevent any potential bias?
  - Does the data target a specific population or a sample of a population?
  - On which period(s) have the data been collected?
  - Did the underlying process of data production or the recording method change during the reference period(s) of the data collection?
  - Was the data collected for another purpose different to my business issue?

4.2. ASSESSING DATA COMPLETENESS

- Are relevant and reliable data readily available for every period and every magnitude considered in the assignment?

[7] See ISAP 1 (2018): 2.5 Data Quality

- Do I have all data that are needed to perform the assignment?
- If data are missing or there are data for which their reliability is not supported for a period or magnitude, how may this fact impair the reliability of the outcome of the assignment?
- Do I have at my disposal any proxies that could reasonably substitute for any missing data or data for which their reliability is not supported?
- If so, can I justify by evidence that using the proxy would not impair the reliability of the outcome of the assignment?

4.3. MISSING, INCOMPLETE, INCONSISTENT, FALSE OR OUTLYING DATA

In case any shortfalls in data quality are identified, several issues may be assessed.

4.3.1. MISSING DATA

- Can I perform the assignment without the missing data?[8]
- Do I have appropriate ways to replace the missing data?[9]
- In case I decide to perform the assignment even though some data are missing, can I reasonably assure the quality of the outcome of the assignment?[10]
- Is it appropriate that I ask an independent party to verify the impact of missing data on the quality of the conclusions of the assignment?

4.3.2. INCOMPLETE DATA

We define 'incomplete data' as data which are not available for the desired period but can be estimated from other available data. For instance, we can be interested in assessing any given magnitude for monthly periods, but we only have annual data at our disposal. In this sense, we say no data are missing. Rather, we deem them to be just 'incomplete'.

- Can I reasonably estimate the relevant data from available data (e.g., monthly data from annual data)?[11]
- Can I test the effect of the estimation on the quality of the outcome of the assignment?
- Can I describe in detail the model used for estimating the incomplete data?[12]
- Are there any proxies that could be reasonably used instead of the incomplete data?

[8] Note that according to 2.5.1 of ISAP 1 (2018), "The actuary should consider whether sufficient and reliable data are available to perform the actuarial services. Data are sufficient if they include the appropriate information of the work."
[9] See ISAP 1 (2018), 2.5.4.
[10] Note that "Deficiencies in Data" is covered by ISAP 1(2018) in 2.5.5.
[11] See ISAP 1 (2018), 2.5.4.
[12] See ISAP 1(2018) , 2.5.4

4.3.3. INCONSISTENT OR FALSE DATA

Data are inconsistent if one piece of the data contradicts another piece of the data (for example the date of a claim precedes the start of the contract) and thus some of the data might be false. In such a case, the actuary may wish to ask:

- Can I identify the root cause of the inconsistency and thereby rectify the problem?[13]
- Can I resolve the inconsistency (for example by substituting the inconsistent data with other relevant and reliable data) so that the remaining inconsistency has no material impact on the quality of the outcome of the assignment?[14]

4.3.4. OUTLYING DATA

Judgment is needed for identifying an outlier and, if it has been identified, for the treatment of the outlier.[15] Both including and completely disregarding the outlier without any adjustment may have a severe impact on the quality of the outcome of the assignment. Therefore, there might be cases in which the actuary may wish to adjust an identified outlier, rather than leave it unchanged or remove it from the data. In such a case, the actuary may wish to ask:

- Can I justify by evidence that the data point in question is an outlier? If so, what are the underlying reasons?
- What is the way of adjustment that best helps to achieve the overall objective of the assignment?

4.4. MANAGING DATA

Actuaries are involved with the implementation of complex models In particular, the use of Artificial Intelligence (AI) systems is becoming a part of an actuary's work. AI systems make use of algorithms and models that learn from past data or present data collection, leading to adjustments to their assumptions and methods. Integral to this process is the use of Big Data.

Big Data refers to large, diverse sets of information that grow at an ever-increasing rate[16] and which are aggregated to extract meaning. The information comes from many sources and may be structured or unstructured. Additionally, when large datasets are used, actuaries are generally expected to be aware of the origin of data, whether this is past documented data, coming from alternative sources, or, synthetic[17] data generated by AI algorithms.

When managing data, the actuary may wish to consider:

- Do I understand the range and nature of the data sources that provide input?
- Can I justify that the data is reliable?[18]
- Does the data contain systematic bias?
- Am I able to verify the data sources?[19]
- Are the data sources implemented on a secure and sound IT infrastructure?

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[13] See ISAP 1(2018), 2.5.2.
[14] See ISAP 1(2018), 2.5.4.
[15] See ISAP 1(2018), 2.5.4
[16] Investopedia
[17] Synthetic data, in the context of AI, refers to information artificially generated by computer algorithms, with the goal of achieving real-world data samples.
[18] See ISAP 1(2018), 2.5.1
[19] See ISAP 1(2018), 2.5.3.

- What checks and changes to the data do I need to make to ensure that the data is fit for purpose?[20]
- Have I appropriately documented any changes that were made to the data, including reasons for excluding data?
- If I make use of synthetic data, am I aware of the context and the parameters that are used to create such data?
- When using alternative data sources (such as news websites, or sentimental analysis scenarios), are those sources reliable?[21]
- Does the data fit the purpose of the analysis it is being used for?
- How is the data being structured organisationally?
- When data is being modelled, am I able to understand the relationship between data elements and data sets?
- How do I deal with data redundancy?
- How do I treat data sources which involved generative AI applications? When does data cease to be data and become model output?
- Would the combination of data used, and assumptions and methods applied, lead to unintended elements in the results such as bias or even discrimination (that may not be allowed by law/regulation)?

4.5. OTHER CONSIDERATIONS

Since the Code of Professional Conduct also requires compliance with laws and regulations, the following checks are also desirable for professional judgment.

- How can I protect the data?
- How can I assure that I am compliant with data protection regulations such as GDPR?
- How to properly anonymize the data?

5. SELECTION OF A MODEL

The self-assessment questions in this section consider the following aspects of model risk:

- Inappropriate methodology[22]
- Too much complexity with no added value
- Model knowledge concentrated on key people.
- Lack of suitable documentation[23]

[20] See ISAP 1 (2018), 2.5.2.
[21] See ISAP 1 (2018), 2.5.3.
[22] See ISAP 1 (2018), 2.7.1.
[23] See ISAP 1 (2018), 2.10.4

Selecting a model[24] requires professional judgment:

- Is the chosen model fit for purpose and appropriate for the intended use?[25] How and why was this model selected? Does it meet its specifications? Have I considered alternative models or the use of more than one model? Is the model widely accepted?
- Do I understand the model, its underlying assumptions, the data needed, how it operates, its strength/weaknesses, its restrictions, and its output?[26]
- Are there any test/validation procedures for assessing appropriateness?[27] Do I understand the sensitivity of results to changes in parameters? Does the model contain any bias or variation?
- Is the model set up in a way to avoid unnecessary complexity (relative to performance/business objective)?
- Are simplifications and limitations properly tested and documented?[28]
- Are the model and procedures documented to properly mitigate dependency on a small number of key people?
- Does it need any complementary interpretation tools like dashboarding / reporting or visualization to make it explainable? Which ones were used to achieve the explanations?

If the model is implemented by another professional third party, a vendor, and/or involves applications of AI, an actuary may address the following aspects:

- Is the underlying methodology appropriate and do I understand how the model works?
- Is the model transparency and explainability well documented and aligned with the model specifications?
- Do I have ways to check the correctness of the outputs? Are the generated outputs explainable and consistent with the assumptions that I have made?
- Do I understand the conditions, pre-requirements, and the model bias which may result in a less reliable model?
- If the model is subject to a certain degree of autonomy (such as AI models where a training and learning process is involved), am I confident that the model does not contain inherent bias by the way that it adapts to its environment?
- Is there sufficient human oversight at sufficient points in the modelling process?
- Do the visualisations techniques fit the purpose of the model?
- Are the techniques used transparent and do they produce reliable model outputs?
- Is the choice of the methodology together with its applied computer algorithm appropriate?
- How do I deal with the degree of uncertainty that the model might have? Is the level of uncertainty well understood, documented and in line with the business goals?

[24] Note that the selection of models is covered by ISAP 1 (2018): 2.10; in fact, it also covers developing, modifying, and running models.
[25] See ISAP 1 (2018), 2.7.1
[26] See ISAP 1 (2018), 2.10.3.
[27] See ISAP 1 (2018), 2.10.2
[28] See ISAP 1 (2018), 2.10.4.

- Are the benchmark methods, used to ensure reliability of models, appropriate?
- If generative AI is being used to generate code used within the actuarial models, are the methods of the underlying generative algorithm used explainable and well understood? Does the generated code fit the purpose of the actuarial model?

6. SETTING AND CHECKING OF ASSUMPTIONS

The setting of key assumptions is of utmost importance for the outcome of models in all fields of the actuarial work, e.g.,

- Liability valuations (best estimate, margins, etc.,…)
- Capital management (standard capital requirements or internal models)
- Firm Valuations (embedded value, appraisal value, ...)
- Pricing activities

The actuarial role in the assumption setting process may be affected by the lack of historical experience, the lack of relevant data or new facts or external variables that could make future experience different. Assumptions on the future behaviour is especially sensitive to professional judgment. The actuary may want to consider all relevant information while assessing reliability and appropriateness of the use of historical data[29] for projecting future outcomes. Additionally, checking the assumptions when generating new data synthetically, or using alternative data sources, is of high importance.

The need to make assumptions arises immediately in connection with undertaking decisions on methodology (e.g., correlations), non-economic variables (e.g., risk classification; mortality and morbidity rates; retirement rates; lapses; expenses, accident frequency) and economic ones (e.g., accident severity, interest and credit rates; inflation rate; equity and property indices). The need also arises in instances such as the assessment of underwriting, claims handling, and reinsurances policies, or the conformity of models with Enterprise Risk Management principles. The self-assessment questions might help the actuary to check and back test consistency in assumptions embedded both in the choice of variables and of the methodology and use of data.

6.1. CHECKING ASSUMPTIONS RELATED TO METHODOLOGY

If the variables and their assumptions can affect the methodology, the following checks may be considered according to 2.7 of ISAP1.

- Would it make sense to do a sensitivity analysis and if so, which variables are to be tested?[30]
- Should I consider using more than one model or more than one set of reasonable assumptions?[31]
- Are expected or potential future trends or sudden changes properly assessed? Do they vary from the past?

[29] Note that according to 2.5.1 of ISAP 1 (2018), "The actuary should consider whether sufficient and reliable data are available to perform the actuarial services. Data are sufficient if they include the appropriate information for the work. Data are reliable if they are substantially accurate …."
[30] See ISAP 1 (2018), 2.7.7.
[31] See ISAP 1 (2018), 2.7.7.

- Are methodology choices based on independent actuarial views and best practices?[32]
- Is the choice of methodology affecting any individuals, or third parties, in any unethical way?

6.2. CHECKING ASSUMPTIONS RELATED TO VARIABLES

The following questions may help the actuary in the assumption setting process as described in ISAP 1 (2018) 2.7 Assumptions and Methodology Set by the Actuary.

- Do I have enough information about the relevance of assumptions on variables in the model outcome, i.e., have I tested sensitivities or performed any stress or scenario testing?[33]
- Do I have enough knowledge on sources, data quality, sample size, and any limiting factors for the choice of variables?
- Do I consider consistency with similar but not identical situations applicable to the specific assumption?[34]
- Are data for each variable granular enough for the model outcome not to be materially false?
- Even if assumptions on each variable seem to be reasonable, does the set of all assumptions seem to be reasonable on an aggregate level?[35]
- Can I be sure about the involvement of the right people providing relevant data and feedback for each variable?

6.3. TESTING

The actuary may consider the appropriateness [36] of assumptions and the internal consistency[37] of assumptions and methodology.

- Is historic reality/experience used to test the validity of the assumptions? If not, why not?
- Are there certain assumptions or ranges of assumptions that when used produce unreasonable results?
- Are the models and the methodology implemented on a secure and sound IT infrastructure?
- Are there enough relevant test methods used to capture the entire spectrum of outcomes and conclusions of the applied methodology?

6.4. OTHER CONSIDERATIONS

As the Code of Professional Conduct requires accountability, the following apply:

- Is documentation on the process of assumption setting and selection of results thorough and complete? Can it be made available for a third party to understand the key

[32] See ISAP 1 (2018), 2.6
[33] See ISAP 1 (2018), 2.7.7.
[34] See ISAP 1 (2018), 2.7.6.
[35] See ISAP 1 (2018), 2.7.5.
[36] See ISAP 1 (2018), 2.7.2.
[37] See ISAP 1 (2018), 2.7.6.

steps of the process? Can another actuary picking up the analysis understand why and how the assumptions were made, especially if unsupported by data?

In setting assumptions, the actuary might also contemplate any conflicts of interest, considering questions such as:

- Could my personal or financial interests influence my judgment in the process of selecting the appropriate assumptions?
- Have I taken adequate steps to mitigate any potential conflicts of interest?

7. THE INTERPRETATION OF THE OUTCOMES OF THE MODEL

Several aspects might be tested in relation to the outcome of the model before the assignment is delivered.

7.1. RELEVANCE

- Are the results conclusive? Are the results reasonable when checked against prior experience and my expectations? If not, is the model providing insights that I had not anticipated, or could I consider re-examining the data, the model and/or the assumptions?
- Could I consider using more than one model or more than one set of reasonable assumptions? If more than one model or set of assumptions has been used, is the choice documented and justified?
- Can I use terminology which will be understood by the users?
- Do the results support the decision-making process of the users of the assignment?

7.2. TESTING

- What tests have been carried out to check the credibility and reasonableness of the conclusions?
- Have test plans, test reports and test conclusions been available for independent review/audit?
- Were the test runs performed on an independent sample from that used for training?
- Were some scenario tests used to assess model relevance on controlled scenarios for which expected outcome can be controlled?
- Has the model been validated in real conditions?
- Has the necessary professional scepticism been used in the choice of data?
- Are the process and methodology robust and consistent enough to assure the relevance of the outcome and conclusions?
- Are all relevant conclusions captured?
- Are the conclusions properly escalated to provide useful information to intended users?
- Can the results from the testing be used to improve the model?
- Am I evaluating the outcomes of the model objectively, without being influenced by personal biases or external pressures?

7.3. AI MODELS

- Can I explain how the model produces its answers?
- Are the algorithms following an understandable and healthy reasoning of their predictions and knowledge gained from data?
- Do I understand the degree to which the predictions of the models can be relied on?
- Do the outputs of the model vary significantly with the same inputs?
- Have I limited the decision-making rules of the model so that outputs can be traced through?
- Have I explained the model to the extent that the user trusts it?
- Are the validation methods of the algorithms and the underlying models well documented and understood by all stakeholders?
- If a model (whether falling under the supervised, unsupervised or reinforced learning category) involves a stepwise decisional process, is this well understood and documented?
- If outcome deviations are existent, can you explain all the assumptions used within the models?
- Are the metrics used to assess the model quality relevant and in accordance with business issues?
- If I have used multiple models, methods, or sets of assumptions, can I explain significant differences in the results? How can I be reasonably confident that I am applying actuarial judgment consistently when selecting among competing models or the results of multiple models?
- Would the combination of data used, and assumptions and methods applied, lead to unintended elements in the results such as bias or even discrimination (that may not be allowed by law/regulation)?

8. COMMUNICATION

The actuary might address the following disclosure issues regarding the use of professional judgment, as applicable to the actuarial services provided, as described in ISAP 1 (2018) 3 Communication:

- Have I communicated which factors affected my decisions when exercising professional judgment?
- What are the key assumptions underlying my actuarial professional judgment? Are these assumptions clearly stated and justified?
- Have I reported any substantial deviations from any applicable guidance or standards?[38]
- Is any material inconsistency with historical data and trends clearly disclosed?
- How can I effectively communicate the rationale behind the chosen assumptions to the intended users?

[38] See ISAP 1 (2018), 3.2.2.a.

- Have I appropriately disclosed any limitations, conflict of interest, or constraints when applying my professional judgment?

Furthermore, the actuary is generally expected to disclose any significant judgments and changes in those judgments.[39]

8.1. DATA

The following questions might help with the communication of the suitability and reliability of the chosen data and analytical methods for the intended actuarial services when exercising professional judgment.

- Have I clearly disclosed the data sources used in my actuarial work?
- Was the data anonymized for disclosure purposes?
- Have I appropriately disclosed the role of professional judgment in interpreting and utilizing the data for this analysis?
- Is the data in the assignment disclosed in my actuarial report in a way that allows any independent and knowledgeable party to check their sources, their completeness and their consistency? Is there enough granularity in the disclosed data?
- Are any shortfalls in data quality, such as incompleteness or the use of proxies, appropriately disclosed?[40]
- Have I adequately disclosed my assessment of the effects of missing, incomplete, inconsistent, false, or outlying data on quality of the outcome and conclusions of the assignment?
- Have I clearly disclosed any data modification made based on my actuarial professional judgment?[41]
- Is it clear to the intended users how professional judgment influenced data selection, treatment, and analysis?
- Have I disclosed the assessment of any uncertainty inherent in the information used when making an actuarial professional judgment?[42]
- Have I properly communicated the sensitivity of outcomes to variations in professional judgment regarding data interpretation?

8.2. ASSUMPTIONS

The following questions might help to check for sufficient and clear disclosure regarding the selection of actuarial assumptions based on the actuary's professional judgment.

- Have I indicated the sensitivity of the results to variations in key assumptions and methodology?
- Has any adjustment to assumptions based on my actuarial professional judgment been explained?

[39] See for example, IAN 100 in Chapter 17 in relation to IFRS 17's disclosure requirements
[40] See ISAP 1 (2018), 3.2.2.c.
[41] See ISAP 1 (2018), 3.2.2.c.
[42] See ISAP 1 (2018), 3.2.2.d.

- Have I disclosed whether an assessment of alternative assumptions or methodologies was conducted?
- Has any change in market conditions that could impact the validity of assumptions been clearly reported?
- Have I communicated the reasoning behind the selection of specific data subsets for analysis and how professional judgment influenced this selection?
- Are all assumptions based on significant judgment appropriately disclosed?[43]
- Have I complied with all relevant laws, regulations and professional standards in the assumptions made and their disclosure?[44]
- Have I clearly identified and communicated any potential biases that may arise in the process of choosing a set of assumptions?
- Have I outlined the steps I've taken to manage any factors that might compromise my professional judgment?

8.3. MODELS AND THE INTERPRETATION OF THEIR OUTCOMES

These questions might assist the actuary in disclosing any decisions made when selecting a model using their professional judgment, validating that the chosen model is appropriate and reliable for the particular actuarial work.

- Have I disclosed any caveats and constraints such as data limitations, lack of validation, and methodology / model limitations that may affect the conclusions?
- Have I disclosed all material hypotheses and scenarios used to draw conclusions?
- Has any material source of uncertainty embedded in the model been disclosed?[45]
- Have I presented the uncertainty in the results by appropriate means, e.g., of confidence levels, standard deviations and so on?
- Were all estimation techniques based on significant judgment appropriately disclosed?[46]
- In some circumstances, it can be useful to evaluate alternative modelling approaches to ensure that the chosen model is suitable for its purpose. In this case, have I appropriately communicated the results of this assessment in our report?
- Have any management actions or responses assumed in the model been appropriately reported?[47] Have I adequately explained their implications in the results? Are the conclusions properly escalated to provide useful information to intended users?
- Have I discussed what are the strengths and weaknesses of the model chosen compared to other potential models?
- Have I communicated how different modelling approaches may affect the accuracy and reliability of the results?

[43] See IAN 100, 17.1
[44] See ISAP 1 (2018), 3.2.2.h.
[45] See ISAP 1 (2018), 3.2.2.i
[46] See IAN 100, 17.1
[47] See ISAP 1 (2018). 3.2.2.j..

- Have I explained how any conflicts of interest or any personal bias could potentially impact my objectivity when interpreting the outcomes of the model?

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