Preface & Request for Feedback

The EAN has grown to be a very interesting and relevant collection of thoughts on the ORSA. One thing we had envisaged, which it has not become, is a "living document" focussing on current best practices (or "good practices") with links to other useful resources, as appropriate.

In terms of the drafting process, we are at a point where there are two key next steps: continuing tidying up the draft and taking a step back with a critical eye to assess what's missing and what doesn't fit in an EAN on the ORSA.

In the draft below, some sections are rather more polished than others.

From you, we would appreciate assistance from anybody interested in a quick read and:

- Assessing whether sections / ideas are useful
- Any that need more description
- Do we want more *examples*?
- Whether anything is missing from what you'd expect the EAN to contain
- Anything that should be removed
- Does it meet your expectations of an EAN? If not, why not? What needs to be improved?

To frame the draft, some of our key objectives have been:

- To bring the ORSA back to something tangible (it might not be for a lot of companies)
- To discuss the size of the ORSA: ORSA as a massive undertaking versus ORSA as the collection of already existing processes
- To clarify the use of "inner" and "outer" scenarios within financial projections,
- The appendix dealing with deviations from Solvency II may also be seen as a "primer on economic capital". Is this something worth including?

Sincere thanks,

EAN drafting team

EAN re ESAP3 - DRAFT VERSION

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Preface

Why does this EAN exist?

The structure of the ESAP3 splits the standards between design, implementation and operation of the ORSA process, and applies to those actuaries with material involvement in, or responsibility for, the tasks identified. Refer to Section 1 (text of 1.1 to 1.5 reproduced below) where the ESAP encourages wider adoption + maybe also a comment about the situation where the most senior actuary involved in the work does not have material responsibility for it.

The importance of reading ESAP3 in the light of ESAP1, particularly in relation to the key verbs "must", "should" and "may"

Some comments on documentation and what was the intention behind the references in the ESAP – linking into what ESAP1 says about documentation too

Recognition that ORSA is a team effort and that, in some companies, much of the related work will be done by other professionals, but it is hoped that the text in the ESAP and the accompanying EAN may be of use to non-actuaries too, in helping to support high standards of risk awareness and risk management in insurance companies across Europe.

…

[Due process background:

In October 2014, the AAE Standards, Freedoms and Professionalism Committee approved a revised Due Process for the development of ESAPs and EANs. Appendix 2 to that note contains the Due Process for the development of EANs. The introduction (paragraph 1.1) to that Appendix states that:

- *"A European Actuarial Note (EAN) is an educational document on an actuarial subject that has been adopted by the Actuarial Association of Europe (AAE) in order to advance the understanding of the subject by readers of the EAN, including actuaries and others, who use or rely upon the work of actuaries. It is not a European Standard of Actuarial Practice (ESAP) and is not intended to convey in any manner that it is authoritative. EANs may be issued:*

  a) To assist actuaries in complying with an ESAP, for example by offering practical examples of ways in which actuaries might implement as ESAP in the course of their work, or

  b) To provide non-binding guidance on an actuarial topic for which the AAE has not developed an ESAP.

…Needs to cover the Proposed purpose for the ORSA EAN (to accompany ESAP3 and assist actuaries in complying with it)

The proposed EAN clearly falls under bullet (a) above. To that end, we propose to address the document to actuaries whose work falls within the scope of any part of ESAP3. The purpose of the EAN will be:

1. To aid the interpretation of the ESAP by expanding on what was in the minds of the ESAP3 drafting team when they wrote particular sections of the ESAP;

2. To support the effective implementation of the ESAP by presenting suggestions for the types of issues that might need to be considered by the actuary in fulfilling the requirements of certain aspects of ESAP3; and

3. To facilitate the sharing of best practice amongst actuaries by including examples of ideas and approaches that have proved effective for those actuaries who already have experience of relevant ORSA-related work.

The EAN will not try to be a comprehensive textbook on the ORSA process. Nor will it add to the requirements of the ESAP. Rather, it will focus on helping actuaries apply the requirements of ESAP3 in an effective and insightful manner. In so doing, it is hoped that the EAN will have a positive effect in helping the actuarial impact on the ORSA to be as effective and value-adding as possible.]

The deleted ESAP3 introduction:

The Own Risk and Solvency Assessment (ORSA) process is envisaged as a key component of the Solvency II framework, providing the Administrative, Management or Supervisory Body (AMSB) of an undertaking with information that can be used in strategic decision-making at the group and/or undertaking level. The AMSB will need to understand the process involved and the reported results. Actuaries across undertakings and member states will play a role in the ORSA process; in some cases the actuaries' contribution will be a significant one, in other cases it may only be minor. Nevertheless actuaries will have a role both as members of the actuarial function and serving other functions of the group and/or undertaking.

This European Standard of Actuarial Practice (ESAP) sets out certain principles which actuaries who have a material involvement in or responsibility for the design, implementation or operation of an ORSA would be expected to observe.

It is envisaged that an actuary who has some but not necessarily material, involvement in or responsibility for the design, implementation or operation of an ORSA will agree with their principal the extent to which the requirements of this ESAP should apply to their work. Notwithstanding the outcome of this discussion, it is anticipated that the requirements of ESAP1 (or requirements that have been deemed substantially consistent with ESAP1) will apply to all such actuarial work.

It is also envisaged that non-actuaries may also consider where appropriate adherence to the principles set out in this ESAP, in order to support a consistent application of ORSA across member states, undertakings, groups and individual functions within undertakings.

Reflecting on the ORSA

The ORSA is step-change improvement in the risk-oversight of the business in the business.

The actuary should make sure the ORSA provides useful information for decision making, not just document about it! And if this was impossible, then require that the actuary should work to improve the process so that this could be done.

Section 1: supplementary notes to ESAP 3 definitions

In this section, the ESAP 3 articles are covered and additional explanations and clarifications are offered to help better understanding. Not all articles have been supplemented if covered sufficiently in the ESAP.

Additional material relating to an "ORSA-triggering event"

An ORSA-triggering event is a material change in the nature of the uncertainties or exposure thereto, or in the understanding of those uncertainties or exposures. An event which would trigger an update to the ORSA (an "ORSA Run") would have such an effect as to change a company's exposure to areas of known uncertainty (risks already included in the ORSA) or areas of new uncertainty (emerged risks). Instead of specifying a certain threshold above which the ORSA is triggered, we have left this judgment to the actuary and/or the business itself. It is the role of the company to determine whose role it is to understand the business in order to know when a re-run of the ORSA should take place and also whose role it is to develop entity-specific limits or thresholds which provide objectivity and structure to "ORSA-triggering events", those limits or thresholds to be reviewed regularly in light of experience.

Examples of ORSA-triggering events

- A macro-economic event which materially increases or decreases a company's exposures (e.g. a fall in equity markets, credit spread widening or tightening, movements to a central bank's base rate or risk-free rates, a change in inflation, GDP or employment—insofar as these affect the company's exposures)
- Change in the state of the world (e.g. government action to change the economic outlook, e.g. UK government removing the compulsory purchase of an annuity on retirement, a legislative change allowing banks and asset managers to provide unit-linked savings products directly to consumers)
- Change in the nature of a company's exposures (e.g. deciding to cease selling new business on a certain product line, or purchasing reinsurance to reduce exposures hence changing the company's aggregate exposures)
- Change in the nature of an underlying area of uncertainty (e.g. a cure for cancer, driverless cars, theft via cyber risk)
- Combined movements in multiple areas of uncertainty which materially change the company's aggregate exposures
- A change in the understanding and/or modelling of area(s) of uncertainty which materially alter a company's exposures (e.g. looking at surrender rates, a move from using only historical experience data to modelling surrenders dynamically, for example via a causal map to model policyholder behaviour)
- Otherwise, any events which may change the aggregate exposure, or the acceptable levels thereof, or include changes to: risk appetite, risk limits, risk tolerance, ERM/RM strategy, business plan, new business strategy, nature of the business (M&A…), etc.

It is important to note that events triggering ORSA runs may be specific to the company (e.g. a fall in equity markets causing an increase in the value of policyholder guarantees or a spike in surrenders on a certain insurance product) or may be shared by many companies in the market (e.g. 2008/9 credit crisis type event). In both cases, the company should evaluate whether an event causes a material change in exposures or uncertainties which would require an ORSA run.

Commented [S1]: I feel that it might be useful to expand the use of examples, i.e. provide a page or two of examples of each bullet that would be applicable to various types of (re)insurer, in table format perhaps.

What do you think?

Structured thresholds to identify ORSA-triggering events

Examples of objective and structured thresholds to identify ORSA-triggering events in the normal day-to-day running of the business might include the following aspects. This list is in general terms and is followed by a list of corresponding real-world examples.

1. Links to risk appetite, risk limits, and risk tolerances (or any such related measures)
2. Risk movements: changes in quantifiable risk exposures, isolated or combined
3. Monetary Loss: actual, expected or potential losses quantifiable in money terms
4. Non-Monetary Damage: actual, expected or potential damage not quantifiable (reliably) in money terms
5. Change in the State-of-the-World-as-we-know-it

6. Breaching limits: e.g. SCR ratio, MCR, internal risk limits

Examples:

1. Links to risk appetite, risk limits, and risk tolerances (or any such related measures)
    - Risk Limit breach;
    - Risk Tolerance breach;
    - Change to Risk Appetite, Limits or Tolerances
    - Breaching SCR Ratio (e.g. 120% of SCR)
    - Breaching MCR
2. Risk movements: changes in quantifiable risk exposures, isolated or combined
    - Mix of new business materially different from what is assumed in the SII SF/IM or ORSA, so that SII SCR changes by a threshold amount, e.g. EUR 10 million
    - Mix of in-force business materially changed (e.g. experiencing a mass lapse on a certain product), which changes SII SCR or SII Available Own Funds by a threshold amount, e.g. EUR 5 million.
    - Economic downturn, characterised by any of: equities -20%, properties -15%, credit spreads ±50 bps, change to the shape of the yield curve, inflation ±1%, etc
3. Monetary Loss: actual, expected or potential losses quantifiable in money terms
    - Actual or expected gain or loss (due to risk events which have occurred) above a certain threshold
    - Potential losses due to policyholder options or guarantees caused by change in the underlying risk(s) above a certain threshold
    - A change in markets, risks, or events requiring a material injection of funds into reserves or capital
4. Non-Monetary Damage: actual, expected or potential damage not quantifiable in money terms
    - Actual, expected or potential damage to reputation, affecting volume and quality for future new business and persistency on in-force business
    - Actual, expected or potential damage to the business following loss of key personnel
    - By "potential" in this context, we mean that following some event, the likelihood of another damaging event has increased materially.
5. Change in the *state-of-the-world-as-we-know-it* that signals…
    - Underlying exposures need to be updated/reconsidered
    - Revisiting some existing Stress and Scenario Tests (SST) or reverse stress testing scenarios in light of new information or new understanding
    - Adding a new SST which incorporates a new potential understanding of the state of the world (e.g. identification of a new, material area of emerging risk to the business), for example a change in central banks' approach to monetary policy and managing inflation and the consequent potential effects on a company's contractual obligations (liabilities) or the nature of risks to assets.

Certain ORSA-triggering events may not require a full end-to-end re-run of the ORSA process. The company and the actuary, as appropriate, should which parts of the ORSA process require completion anew.

Section 2: supplementary notes to ESAP 3 text

The purpose of Section 2 is provide supplementary material that may assist the actuary in interpreting and making use of the guidance in ESAP 3.

ESAP 3, Seciton 3.1 "Design of the ORSA process"

[no additional text]

ESAP 3, Seciton 3.1.1 "Establishing a structured approach to uncertainty"

Some of the key purposes of the ORSA (processes, models, etc) are to understand the reality of the business, increase a firm's understanding of its risk, exposures, activities and strategy, and to formalise that into a set of processes and capture learnings. One of the key unsung challenges will be to maintain that knowledge within the business without an unnecessary proliferation of documentation.

Maintaining such knowledge is always a challenge. A proliferation of documentation is a risk (or a certainty!) and there is an associated risk of loss of relevance of the ORSA. It is important that issues are recorded even if not planned to be addressed. The evolution of an actuary's understanding of risks, exposures and business realities is, at times, rather "stream of consciousness". When this leads to an increase in understanding, it should be captured (maintained within the business). This should be an ongoing process, e.g. a feedback loop which is not forgotten.

One of the aims of this section, 3.1.1, is to guide the actuary in the right direction: a robust approach to dealing with uncertainty…which is, of course, structured and documented. The intent is not to prescribe the approach, but to let the actuary develop as appropriate or required by the business.

Other related aims include encouraging the actuary to capture that knowledge and the process and promoting the sharing thereof within the business, especially with users of the ORSA and other professionals in similar activities.

If the actuary is involved in designing the ORSA process, ESAP 3 guides the actuary to establish a structured approach to uncertainty and to document it. Where the actuary is involved in the ORSA process, but not in its design, the actuary may wish to contribute to ensuring that the approach to uncertainty is structured, documented and sufficient given the business needs, complexity of the business, and the materiality and proportionality of risks and exposures.

In addition to the points of section 3.1.1 of ESAP 3, the ORSA process might:

- Facilitate the sharing of new information and best practices within the ORSA team and wider business
- When the approach to or understanding of areas of uncertainty changes, the ORSA process and/or ERM framework may need to be adapted.
- Where the ORSA process and/or ERM framework change, the approach to uncertainty may need to be adapted
- The current approach to uncertainty should not preclude the use of new or different methods, especially where these methods may be an improvement. Where materially improved methods are known, but not used, the actuary may wish to document the reasoning.
- The current ORSA and/or ERM framework should not preclude the use of new or different methods to dealing with uncertainty

A structured and documented approach to uncertainty might have some of the following components, according to the needs of the business.

- Differentiation among "types" of uncertainty
- Distinction between the real world and the modelled world
- Feedback loops and several points for capturing feedback
- Comfort in dealing with uncertainty
- Distinctions among past, present and future

The following sections provide more detail regarding the components of a structured approach to uncertainty.

Differentiation among "types" of uncertainty

Errors vs uncertainties

The AIAA (American Institute of Aeronautics and Astronautics) defines "errors" as recognisable deficiencies of models and algorithms and "uncertainties" as potential deficiency due to lack of knowledge.[1]

Aleatory uncertainty vs epistemic uncertainty

Physicists often distinguish between aleatory and epistemic uncertainties. "Aleatory uncertainty (also referred to as variability, stochastic uncertainty or irreducible uncertainty) is the physical variability present in the system being analysed or its environment. It is not strictly due to a lack of knowledge and cannot be reduced. […] Epistemic

[1] Stanford Uncertainty Quantification Laboratory, "YouQ: A self-guided tour of Uncertainty Quantification". Web. Stanford. Accessed 12 February 2016. http://web.stanford.edu/group/uq/uq_youq.html

uncertainty (also called reducible uncertainty or incertitude) is a potential deficiency that is solely due to a lack of knowledge."[2]

Non-immediacy, non-specificity, entropy-like uncertainty, and fuzziness

This distinction is borrowed from mathematics and information theory. "Non-immediacy" is characterised by lack of knowledge locally where sufficient knowledge exists elsewhere. "Non-specificity" is characterised by lack of precision, perhaps due to the dimensional size or the complexity of a system. "Entropy-like uncertainty" is characterised by the unpredictability of information content. "Fuzziness" arises from information loss due to interpretation and use.[3]

These are examples of classifications of uncertainty due to origin, properties or characteristics. In practice, it would be useful for such a classification to be mutually exclusive and collectively exhaustive (MECE), but it is not a requirement. The third grouping from above may be translated to actuarial work as follows:

Non-immediacy: lack of knowledge within the local team (e.g. actuarial or modelling team) where this knowledge exists elsewhere (e.g. personal tax rules, precise policy terms and conditions), for example, incomplete knowledge by a junior modelling actuary.

Non-specificity: incomplete understanding of the situation or system, a system which is too large or too complex to model completely, too many sources of uncertainty or "randomness", for example, modelling equity prices as a random process and ignoring the potential effects on equity prices of, for example, changes in interest rates, forward guidance, or QE.

Entropy-like uncertainty: in an actuarial situation, entropy-like uncertainty might be best understood as the uncertainty arising from the reliability (or lack thereof) of information, data and model output. A common actuarial example of entropy-like uncertainty is the "funnel of doubt" associated with the increasing imprecision of financial projections with increasing distance (time) into the future.

Fuzziness: loss of content of a given piece of information when only a portion of that information is extracted for use; for example, not leveraging the knowledge of policyholder behaviour which may be known or suspected by the salesforce or "front line", but unknown to the modelling actuary.

Core traditional actuarial work lies in the reduction of non-specificity via analyses, calculations and sophisticated modelling. Quotidian actuarial work may also include reducing non-immediacy in the implementation of actuarial models. Reducing entropy-like uncertainty has come to the forefront of actuarial work with the introduction of Solvency II and the focus on data reliability and model validation. Actuaries collaborating with other business functions often work to reduce fuzziness.

Some of the most common actuarial techniques address different types of uncertainty. The following list of examples demonstrates this:

- [to be completed]
- Working to understand causal factors affecting policyholder lapses and surrenders
- Building coherent macro-economic stresses for use in stress and scenario testing
- Specifying dependency relationships (e.g. copula or covariance matrix) among risks
- [to be completed]

[2] Ibidem

[3] Dubois & Prade, Fundamentals of Fuzzy Sets. Print. Springer, New York, 2000. Chapter 8 "Measures of Uncertainty and Information."

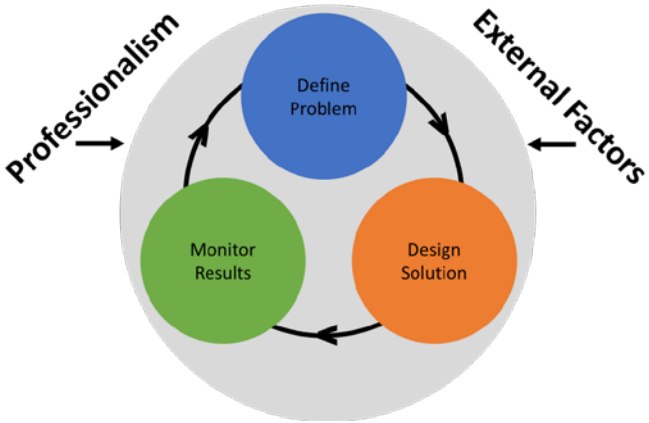
Distinction between the real world and the modelled world

Strictly speaking there are three points here: the real world, our understanding thereof, and the modelling of our understanding. At each point, information is lost: we do not understand the world completely and our models either do not or do not need to capture our full understanding of the real world.

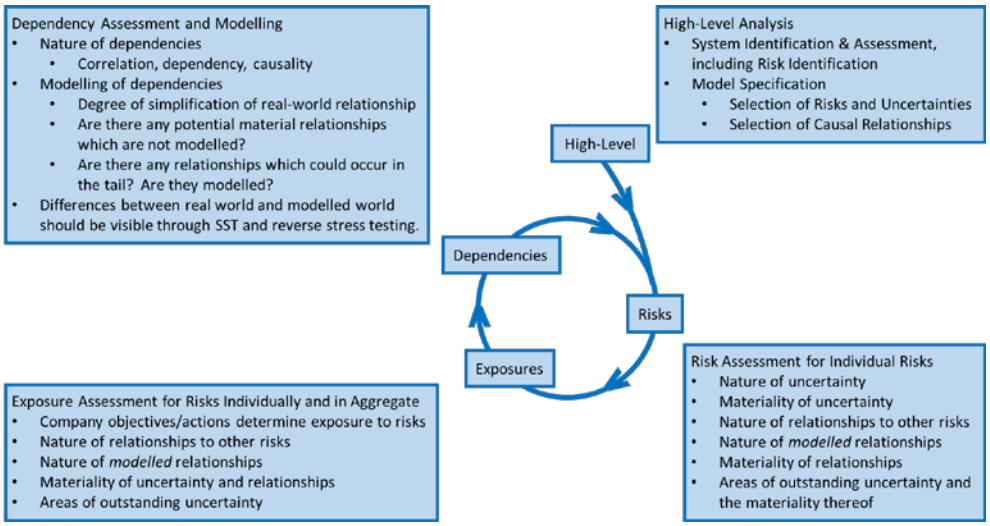
Feedback loops and several points for capturing feedback

At the very least, there should be a connection between business objectives and business actions, e.g. via Objectives, Actions, Feedback ("OAF"). This is a minimal feedback loop which may be expanded depending on the situation.

For many actuarial processes or investigations, the traditional cycle doesn't fully capture the adaptive process undertaken by an actuary.

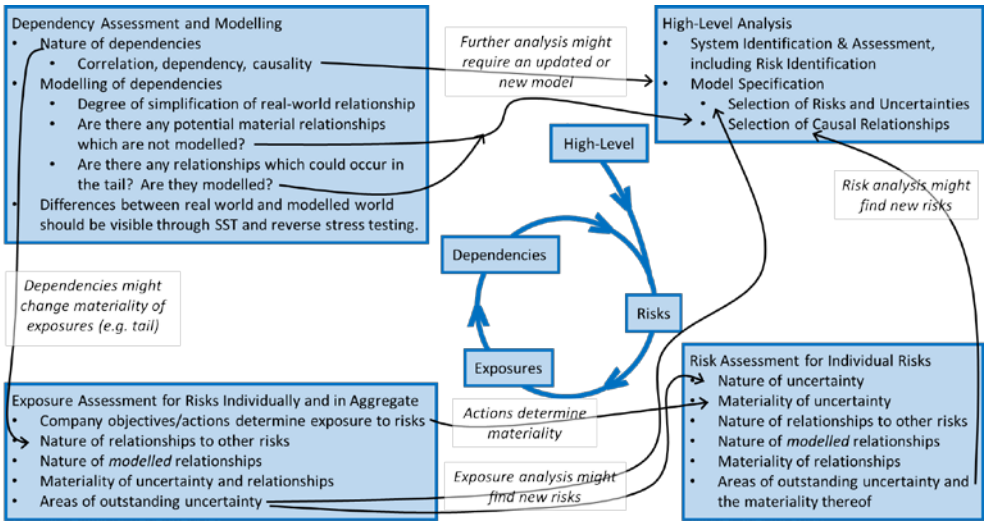


A more detailed example for risk modelling is given below.



The "high-level analysis" is portrayed outside of the loop as this is commonly what happen in practice. For example, risks not included within the model are unlikely to be incorporated at a later date unless very material. From experience, it is the logical interactions among risks and cash flows that are the most difficult (or time consuming) to change once a model has been implemented. This is often an impediment to the improved modelling of risks or of the contractual terms of an insurance policy.

The following variation on the above diagram illustrates a more adaptive process, due to the depiction of "live feedback points", a bit like chutes and ladders. Each "live feedback point" should result in a note being made (perhaps to be addressed at a later date) or an immediate action (e.g. returning from exposure assessment to risk assessment to analyse a risk which has increased in materiality).



Comfort in dealing with uncertainty

There will be incomplete knowledge within the actuary's understanding of a given system, within the modelling thereof and within the risk system capturing (some of) that information. The materiality and proportionality of the areas of uncertainty should be captured, even if not modelled, so that this information is not lost in the flow of "risk information".

Different types of liability models or ALM models, risk models and risk aggregation models may deal with uncertainty in different ways. Some models may deal with uncertainty using probabilities, some stochastically, and some without regard to likelihood may deal with uncertainty via stress and scenario testing. Different approaches may be appropriate to meet different needs. The actuary should be comfortable that the uncertainty is captured materially within the risk system and is communicated as necessary, e.g. within the ORSA process.

Uncertainty might be due to an incomplete understanding of the situation or system or the incomplete capture of the system within the models (uncertainty in the parameters, models, or algorithms). If possible, for each area of uncertainty the sources of uncertainty and levels of materiality should be known.

One potential way to categorise uncertainty is by the amount and by the nature of those uncertainties, placing assumptions, models, et cetera into categories. For example, a categorisation may include the following distinctions: "accepted truth", "theory", "hypothesis", "supported suspicion" and "suspicion". In this list, credibility is the variable factor and should inform how each item is used "downstream" within a risk system. There are other, perhaps better, ways to assign credibility to uncertain things. Where material, it could be valuable to communicate the downstream *compounded* uncertainty.

Commented [S2]: This is my own drafting, but I don't particularly like this paragraph. Does anyone find it useful?

Distinctions among past, present and future

Data is from the past, even if the immediate past (e.g. current market data). When using past data to project future events (e.g. probabilities of life/death, cash flows, asset returns), the distinction between past data and future projection should be reflected in the model or noted as an assumption.

For different areas of uncertainty, there is a *range* of validity of the assumption that past data can be used for future projection or prediction. It is not "either/or", i.e. that it "is valid" or "it is not valid", but rather a *range* of validity.

It is the actuary's judgment as to whether such an assumption is sufficiently valid. This may depend upon the inherent validity of the assumption, relative validity of any alternative data available, alternative modelling methods, resource and time constraints, materiality and proportionality of the assumption itself or its potential affects downstream.

ESAP 3, Seciton 3.1.2 "Deviation from Solvency II balance sheet approach and methodology"

The methodology should consider the significance of the risks being modelled, the extent to which the risks may be modelled reliably, and the level of proportionality that could be applied to modelling these risks. The consideration of materiality should be done both for the risk in isolation and as it aggregates or interacts with other risks, perhaps at multiple levels within the company's or group's structure, as necessary.

The methodology chosen in ORSA usually deviates from what is used in SCR in both ways; how the cash flows are calculated and what kind of risk profile has been set. And in multiyear projections the chosen methodology is stressed even more. Where the ORSA model contains cash flows not in SCR or has different underlying assumptions behind it, companies can model risk events differently and also risks not included in SCR.

To meet the needed substance, the modelled cash flows needs to be consistent with the way business is being practiced and managed. This basically is already something that is validated when calculating best estimate liabilities for market value balance sheet and SCR but for the parts that differ it needs to be also justified (e.g. for cash flows not in SCR). To include properly the business being managed perspective into ORSA cash flows, actuary needs to find out how is ORSA connected into the business-planning process. For example ORSA needs to have a functionality to be able to capture the company strategy with the main written policies (underwriting, investments, capital management and risk management). And the actuary needs to check that the functionality works properly so that different decisions can be put in action in the ORSA scenarios. Solvency II legislation gives

good guidance especially for life insurers through articles on management decisions and future benefits, but again when the chosen methodology deviates from what is used this all needs to be re-checked.

Modelling the risks might inherently be already in the cash flow model structure but might also be a separate process linked to the cash flows. Either way, an actuary needs to ensure that the model is consistent with and produces the risks that are defined in ORSA (e.g. by using the riskmap in appendix YY). --- SOME TEXT ABOUT MODELLING RISKS RELIABLY ---

The chosen ORSA modelling methodology with all the risks modelled needs an assessment of compliance. This might include for example some of the following:

- *the risk parametrization process*
- *how the model is able to capture the risks being modelled*
- *How the business planning is captured in the process and what are the caveats there*
- *what risks included what is not*
- …

When comparing ORSA and solvency II SCR structure, also correlations needs to be assessed. This might be extremely hard task especially on the top level correlations, e.g. between the insurance and market risks. Anyway some relations could be investigated through the macro-economic link the stock market and the population demographics or consumer behaviour might have.

The ORSA as a simplified "business projection model"

The ORSA is also a "business projection model", it intends to project the balance sheet (and perhaps annual accounts) and the underlying business into the future. This necessitates the calculation of the expected SII position and SII balance sheet components at given points in the future. The ORSA may project the business on solely the SII basis or it may include all balance sheet and accounting bases relevant to the company (e.g. local accounting rules, IFRS, ratings agency capital).

In projecting the Solvency II balance sheet into the future periods of the ORSA, the company may wish to calculate future balance sheet components on the SII SF (or Internal Model) basis, i.e. consistently with current methods. The ORSA then serves to project the future SII capital position (and other balance sheet components) as the company expects it to evolve in reality. This should be expected to provide insight into, for example, movements in the solvency ratio, reserve or capital injections or releases, future dividends, and the drivers of profit and loss.

In order to get the full picture of future profit and loss, the company may need to project the full accounts on all bases used by the company. While useful, this extends beyond the requirements or suggestions of the ORSA.

In addition to, or in lieu of, the regulatory basis (SII SF or SII IM), the company may wish to reflect risk on an objective basis (commonly known as "an internal economic capital framework" or, specifically for the ORSA, the "Own Solvency Needs"). Projecting the ORSA on the SII SF (or SII IM) basis should be considered a necessity. Projecting on an additional basis may be useful for managing or understanding the underlying risk exposures. Some of the areas of deviation from the SII principles are described below.

Underlying the projection of the business into future ORSA periods is a set of assumptions of how the business and world may evolve in the near future (5-10 years). One such set of assumptions may reflect a "Best Estimate" scenario, another may reflect the management's business plans, and additional scenarios may test other positive and adverse future scenarios.

The SII Standard Formula and OSN are used for calculating the total asset requirement (reserves plus capital) of a company while the ORSA is used to project their balance sheet items into the future, perhaps annually for the next five years.

The Risk Profile Assessment: Assessing the Appropriateness of the Standard Formula

As part of the ORSA, the actuary may assess the significance with which the risk profile of the undertaking or group concerned deviates from the assumptions underlying the Solvency Capital Requirement[4].

The results of the assessment may lead the actuary to opine that the Standard Formula is suitable for the company or that the company should consider calculating their Own Solvency Needs. Calculating OSN may range from adjusting the stress factors applied the individual sub-modules or otherwise adjust the parameterisation of the Standard Formula to a complete reworking of the methodology. Potential variations to parameters, methods and modelling is provided in the appendix.

Consistency or inconsistency of the ORSA with the Solvency II principles

As regards consistency, or inconsistency, of the ORSA methodology, process or modelling with the Solvency II principles and rules, the actuary should understand and communicate the effects thereof. In some cases, consistency with SII principles and rules may mean that the ORSA does not reflect otherwise objective assumptions. In some cases, consistency may be the best or only option. Examples of the main areas of potential discrepancy are given below.

In principle, Solvency II is risk-based. However, the Level 2 guidance deviates in various respects, both for Standard Formula (SF) and Internal Model (IM), from otherwise objective assessments of risk. One of the fundamental goals of the ORSA is to reflect reliably the reality of the business, currently and in the future. For this reason, it may be useful to project, within the ORSA, the SII standard basis as well as an additional basis intended to more reliably reflect the risk exposures of the company.

There are some areas of the SII SF and IM guidance which deviate from an objective best estimate, for example, the ultimate forward rate (UFR), cash flow matching and discounting at other than the net yield. If the actuary wishes to use alternative objective assumptions (which should be credible in their own right), s/he should justify and explain the deviation and the effects of such deviation (i.e. difference between the ORSA run on SII assumptions vs the objective best estimate assumptions which should reflect reality).

Insofar as SII capital is projected within the ORSA, it should be consistent with the SF or IM. However, the underlying projection assumptions for the ORSA (a best estimate baseline, the business plan, or a sensitivity) need not be consistent with the SII Pillar 1 or 2 assumptions. That is, the projection for the ORSA may be a real-world projection (if the SII IM/SF is not) to reflect RW expected defaults, RW investment yields, which may not be specified in the SII guidance (as some are overly prudent when compared to a RW BE). This may be appropriate in two respects: the "outer scenario" for the projection between future ORSA periods (e.g. to take the company from the current valuation date, e.g. year-end 2017, into future year-end reporting dates) as well as the "inner scenario" as used within the calculation of the SII balance sheet components at future ORSA periods (e.g. future year-end reporting dates).

Additionally, there may be a "core set" of inner assumptions (an "objective best estimate") from which to derive the various sets of assumptions to support Solvency II reserves and capital, IRFS accounts, local accounting rules and reserves.

Importantly, SII capital should be projected consistently with SII guidance. This means that the company should project the SII balance sheet and capital into the future as it expects it will calculate the SII components in the future (perhaps the company is considering moving to an Internal Model).

The ORSA provides the company to use an alternative measure of capital needs, specifically within the ORSA projection, which the regulation refers to as the "Own Solvency Needs" (OSN). The assumptions feeding into OSN may be distinct from those underlying the Solvency II Standard Formula (and Technical Provisions) in both the calculation of reserves and of capital. In this case, the entity should describe the deviations and the effects in isolation and in aggregate compared to the Solvency II balance sheet.

[4] https://eiopa.europa.eu/Publications/Standards/EIOPA-14-322_Underlying_Assumptions.pdf

The outer scenarios driving the ORSA projection may also differ from the assumptions underlying reserves and capital. Some of the main areas where SII and ORSA assumptions may differ are summarised here and discussed below. The groupings are not perfect and noting that one such area may logically belong to multiple groupings.

Commented [S3]: One thing we might like to add to the list below is whether each thing is related to OSN, ORSA, reserves, capital, inner or outer scenarios.

Would this be valuable?

Topics are given here, details are provided in the appendix.

Differences in methodology:

1) Risk measure: VaR, CVaR, TVaR, burn-through, long-term ALM & liquidity, etc
2) Risk measurement time frame: 1-year, 1-day, 5-year plan, policy lifetime, etc
3) Projection basis: what is Best Estimate and why?
4) Total Balance Sheet approach to risk capital versus policyholders' protective risk capital
5) Fungibility of capital
6) Granularity of risk and the level of diversification among risks, products, portfolios, business units and legal entities
7) Nature of stresses: isolated stresses + aggregation vs causal SST vs combined stresses
8) Risk-neutral ESG implementation
9) BEL assumes risk free (MA&VA relax this a bit), SII capital addresses the risks, but some BEL > Economic BEL

Differences in modelling:

10) Nature of the market stress model: causal or combined vs silo'ed
11) Longevity-mortality model: combined vs separate
12) Longevity-mortality-morbidity(-disability) model: combined vs separate
13) Lapse model: SII simplistic, SII strict vs coherent
14) Interest rate up/down model: single model (e.g. Monte Carlo) vs "worst-of" two stresses model
15) Interest rate stresses & the UFR
16) Dependencies & correlations
17) Loss absorbing capacity of deferred taxes
18) Defaults, downgrades, credit spreads, and market values: modelling needs and risk exposures (different exposures to different SII TBS components)

Differences in assumptions:

19) Contract boundaries
20) Counterparty default
21) Future new business
22) Transitional measures (equity type 1, TMTP)
23) Equity symmetric adjustment
24) Discount curves:
    - The ultimate forward rate
    - The last liquid point
    - The volatility adjustment
    - The matching adjustment
25) Sovereign credit risk: spread movements, MV movements, risk capital, etc
26) Cash flow matching
27) Reinvestment risk (implicitly hidden b/t CF matching and the RFR)
28) Risks not covered in the SII SF/IM
29) SII SCR (SF/IM) stress magnitudes (e.g. mort, long, lapse)
30) The SII Best Estimate is benign. Should a market crash feature in a Best Estimate?

ESAP 3, Seciton 3.1.3 "The ORSA consideration period"

The "ORSA consideration period" as used in ESAP 3 is intended to encompass (1) the overall time horizon over which the ORSA process (and all of its individual ORSA "runs") is considered or applied as well as (2) the individual ORSA runs. That is, when considering how far into the future the ORSA should be used, the points in ESAP 3 section 3.1.3 should be considered. Also, within an individual ORSA run, the same considerations should be made (i.e. section 3.1.3).

We did not want to introduce additional terminology that may have led to confusion or would not be readily understood. We also did not want to constrain how the actuary thinks about time periods and the ORSA. In the following discussion, we distinguish

among various time horizons relevant to the ORSA and offer some definitions and terms. We encourage actuaries and their companies to decide on their own terminology and distinctions, being as precise as possible.

In theory, and in the minds of regulators, the ORSA is a vital tool in managing an insurance company. Currently for many companies, the ORSA may not be fully integrated within the business or within its business planning processes. The following discussion assumes the ORSA and business planning process are readily integrable and we suggest that you consider the following discussion points and the applicability thereof to your company's current situation as well as future state.

Time horizons related to the ORSA

There are numerous timeframes, time horizons and time periods relevant to the ORSA. These might include: the business planning period; time periods and horizons within actuarial, capital and risk models; risk-related timeframes such as measurement periods, timeframes for the evolution or treatment of risk events; timeframes for policyholder considerations such as security of benefit payments, inter-generational equity, company solvency—which may extend well beyond business plans or the ORSA.

The ORSA should project the business, its plans, as well as the current state and thinking into the uncertain future. Hence, the ORSA aims to predict what will be business as usual (BAU) in, for example, three years' time. At that point in the future, the company would use its actuarial and capital models, think about its risks, risk appetite, strategy, et cetera and revise them appropriately given what has transpired in the theoretical past (i.e. three years of deterministic, assumed a priori, modelling).

The ORSA will only be used to project things 5 or 10 years into the future, beyond which timeframe it may be difficult to create a credible prediction of the ORSA projection (i.e. period before liability and capital models begin).

The following gives an overview of such timeframes, with the focus being on the distinction of timeframes specific to the ORSA.

1. Liability-related timeframes

    a. "Actuarial projection horizon": e.g. 50 to 100 years for some life assurance products, 5 to 10 years for some general insurance products

    b. "Horizon for long-term considerations": run-off of existing portfolios (and planned new business) and associated considerations (cross-generational equity, fairness, security of benefit payments, company solvency, Prudent Person Principle, etc)

2. ORSA-related timeframes

    a. "ORSA projection period": each of the ORSA projection terms from 1 year, 2 years,…, 5 years, i.e. the amount of time that is assumed to pass before the company were to rethink its strategy, plan its business and run its actuarial models. For example, there may be an ORSA run with an "ORSA projection period" of 1 year into the future, another ORSA run with an "ORSA projection period" of 2 years, and so forth.

    b. "ORSA projection horizon": the maximum term the ORSA is used over, something like five years. The ORSA projection horizon is fixed as the longest "ORSA projection period".

3. Business planning timeframes

    a. "Business planning period": this should really be what it is actually in the business. If the company has a 5-year plan that feeds into its strategy, that's it. If it has a 10-year plan which reliably feeds into its planning, that should form part as well. This leads to what one might call the…

    b. "Business's strategy horizon": given where a company is today, how far are they looking into the future as it relates to their strategic initiatives and moves? Let's say they look about 10 years into the future. This ten-year focus could be considered within the ORSA at each future time point in the ORSA process (e.g. 1,2,3,4, and 5 years into the future). That is, with a 3 year ORSA projection period, the company could consider what their strategy would look like between 3 years in the future (the "present time" in that future scenario, i.e. it is known what has happened in the first 3 years) and 13 years in the future.

Regarding that last point, a company may think that applying a 10-year strategy horizon on the end of a 5-year ORSA projection period is insufficiently credible. However, if a company has a "10-year plan" today, it will likely have a 10-year plan next year and the following year. Hence, it would be more appropriate to retain the full strategy horizon at each point in time for the ORSA. While it may be difficult to decide what the 10-year plan may look like five years into the future, this is precisely the task set to the business under the ORSA, among other tasks. The extent to which it is necessary to fully incorporate the full strategy horizon within the ORSA is left to the discretion of the actuary and the company.

There is an important distinction between business planning and long-term considerations: the business's strategy horizon may not extend as far into the future as some long-term considerations need to, for example security of policyholder annuity payments. However, it is vital that the long-term considerations be addressed at each point in time when the business plan is revisited (both in the real world and within ORSA projections). Some of the long-term considerations will naturally be included as the foci of regulations while other long-term objectives, goals and considerations are not required to be addressed (i.e. by legislation or regulation). The actuary should ensure that all significant long-term considerations, explicit and implicit in the business's plans and strategy, are included within the business planning process and within the ORSA. Emphasising this focus and the distinction should give comfort to regulators and the business itself that the business is being managed well and prudently.

Risks with distinct measurement periods should be brought onto a consistent measurement period, where possible. The risk measurement period should be incorporated into the ORSA coherently (e.g. via a multi-year projection using 1-year risk distributions)

The business planning process and the ORSA

Normally, the base scenario should be consistent with the business plan, unless those assumptions are so inconsistent or unrealistic that the resulting ORSA report would be misleading. If this is the case, the reasons should be documented. Where the ORSA is not consistent with the Business Plan, it is good practice to disclose this and outline potential implications.

The business plan, business planning period (BPP), as well as related processes, protocols, decisions and committees are important to the ORSA. A company may have a strategy, company policies, and key performance indicators for monitoring the business. The ORSA should take into account, as far as possible and appropriate, the business plan—in its entirety as well as the various components. Actuaries should ensure that ORSA is consistent with business strategy, policies, KPIs, KRIs, and other policies. This should aid the actuary in getting all the relevant information into the ORSA process.

The business planning period is that natural time horizon over which the firm's strategy and business plan are considered into the future. It may be 5 years if the firm has a "5-year plan". A "10-year plan" necessitates a 10-year business planning period. Projection assumptions 10 years into the future (or further or shorter) may be too uncertain to be credible. Different aspects of the business plan may be credible over different time horizons. The significance of each aspect, the credibility thereof, and the potential for misleading results should be considered for each aspect and in aggregate.

The BPP may be different for different types of product (e.g. term life assurance, auto, participating savings) and whether considering in-force business or new business. The company's overall BPP should incorporate all of these.

The business plan should be developed as with everything else ORSA-related—as appropriate for the business. This may include such activities as horizon scanning for forthcoming changes in the "world as we know it" and potential emerging risks—to the extent that these could reasonably affect the business or its plans in the "near" future. The business plan and the period over which it is considered, may be influenced by known changes coming in the future, for example IFRS, IAIS capital standards, or key policy documentation rules.

The ORSA should be consistent with the company's future business plans, including new business strategy, strategy for in-force business, and long-term considerations. Moreover, the ORSA should form an integral part of the business's business planning process especially as relates to risk (quantifiable and qualitative) and capital (adequacy, availability, etc).

Inner Assumptions and an Aggressive Business Plan

The assumptions underlying a business plan may differ from those of an objective best estimate or those underlying the Solvency II balance sheet. Even an aggressive business plan (e.g. extreme cost savings, unrealistic future new business levels) may be run through ORSA process to estimate the effects on the business of that scenario. The main potential issue is that these aggressive assumptions affect the Solvency II Technical Provisions or capital, either within the ORSA projection or at a standard valuation date note connected to the ORSA.

In running an aggressive business plan through the ORSA it is vital that the actuary ensures that the underlying aggressive or optimistic assumptions do not unduly affect the "time-zero" SII balance sheet and that the incorporation into future SII balance sheets is done so with a focus on the credibility of information. An actuary would not blindly incorporate future predictions into experience analyses feeding into the assumption setting process for actuarial, investment or business assumptions. Put another way, it is important that the company cannot "monetise" an optimistic strategy (e.g. cost savings) simply by committing to do something in the future without having credible historical experience data. For this reason, such aggressive assumptions should not affect Solvency II assumptions (within or without the ORSA process) without sufficient credibility. In the absence of other guidance or regulation, it is the responsibility of the actuary to ensure forward-looking assumptions are used in a credible manner within the ORSA. This will serve to protect the actuary, the business, and the policyholders from overly aggressive business plans.

In order to reflect a cost-savings plan, for example, it may be appropriate to adjust future assumptions in one of the three following manners:

- Situation: initial capital outlay of EUR 1 million, cost savings of 10% after 1 year, an additional 10% after 2 years, and the final 20% savings after 3 years

- ORSA "outer" assumptions reflect the business plan

- Option 1: "inner" assumptions reflect future cost-savings plans as the "Best Estimate" within the underlying calculations of reserves and capital. Future periods' reserves and capital fully reflect the forward-looking assumptions. This is the more aggressive option.

- Option 2: "inner" assumptions reflect new retrospective data fully to reflect a credible cost-savings plan. *Future* forward-looking assumptions are not reflected in future periods' reserves or capital.

- Option 3: "inner" assumptions reflect new data partially to reflect a potentially overly-aggressive cost-savings plan. There is a question whether cost-savings will be achieved in reality. Hence, forward-looking assumptions are assessed to be overly-aggressive and are made more prudent as they feed into the calculation of future periods' reserves and capital. This is the more prudent option.

Which option is most appropriate for the business plan and the company's ORSA should be decided by the actuary and the company. However, it would not be appropriate to reflect the first option in the calculation of regulatory reserves and capital under Solvency II outside of the ORSA process, i.e. for the calculation of the reported Solvency II balance sheet. That is, it would not be appropriate to release reserves or capital in respect of future business plans before those plans have been shown to be credible. This detail has not be addressed directly in the Solvency II regulation but should be fundamental to the prudent management of an insurance business.

Incorporating Aggressive Assumptions into the ORSA and Future Periods' Reserves and Capital						
ORSA Projection Period (years)	0	1	2	3	4	5+
Cost-Savings Business Plan						
Capital Outlay	EUR 1m	-	-	-	-	-
Cost savings from expenses	-	10%	10%	20%	-	-
Future expenses (as% of t=0 Best Estimate)	100%	90%	80%	60%	60%	60%
Option 1: Reflect future cost-savings plans as the "Best Estimate"						
T=0 TP&C	100%	90%	80%	60%	60%	60%
T=1 TP&C	N/A	90%	80%	60%	60%	60%
T=2 TP&C	N/A	N/A	80%	60%	60%	60%
T=3 TP&C	N/A	N/A	N/A	60%	60%	60%
T=4 TP&C	N/A	N/A	N/A	N/A	60%	60%
T=5 TP&C	N/A	N/A	N/A	N/A	N/A	60%
Option 2: Reflect only retrospective data of future cost-savings plans as the "Best Estimate"						
T=0 TP&C	100%	*100%*	*100%*	*100%*	*100%*	*100%*
T=1 TP&C	N/A	90%	*90%*	*90%*	*90%*	*90%*
T=2 TP&C	N/A	N/A	80%	*80%*	*80%*	*80%*
T=3 TP&C	N/A	N/A	N/A	60%	60%	60%
T=4 TP&C	N/A	N/A	N/A	N/A	60%	60%
T=5 TP&C	N/A	N/A	N/A	N/A	N/A	60%
Option 3: Overly-aggressive assumptions are tempered for use in the "Best Estimate"						
T=0 TP&C	100%	*100%*	*100%*	*100%*	*100%*	*100%*
T=1 TP&C	N/A	*95%*	*95%*	*95%*	*95%*	*95%*
T=2 TP&C	N/A	N/A	*90%*	*90%*	*90%*	*90%*
T=3 TP&C	N/A	N/A	N/A	*80%*	*80%*	*80%*
T=4 TP&C	N/A	N/A	N/A	N/A	*70%*	*70%*
T=5 TP&C	N/A	N/A	N/A	N/A	N/A	*70%*

The underlying assumptions of option 3 are that only about half of the planned cost savings will materialize and that only a maximum of 30% savings is realistic after four years. This is only an example.

ESAP 3, Seciton 3.1.4 "Inconsistency with the undertaking's risk management approach"

Models, including those supporting the ORSA, will be necessary simplifications of reality. For example, for actively traded asset portfolios or complex hedging strategies, the actuarial projection models will likely simplify the ALM

approach used in reality. Where a simplification either causes risks to be ignored or for the ORSA to differ from business reality, the actuary should assess the significance of the deviation.

[more text here, perhaps a generalisation]

ESAP 3, Seciton 3.2 "Performace of the ORSA process"

[text]

ESAP 3, Seciton 3.2.1 "Quantitative risk assessment and financial projections"

Considerations for stress-testing, reverse stress-testing, and scenario-testing.

The projections, or point-in-time stresses, used in the ORSA process should include a base scenario and several plausible adverse scenarios. Each scenario should take into account not only in-force policies but also the policies assumed to be sold during the projection period (where applicable). It may also be useful to include positive scenarios in order to understand the potential upside of future decision making.

The base scenario should reflect a realistic set of assumptions used to forecast the expected financial position over the projection period. However, the actuary should be cognisant that the past relationships between assumptions may be different from those applicable in the future.

In determining the stresses and scenarios to be considered, the actuary should consider the exposures of the particular entity to risk concentrations.

Where there is a significant risk exposure, the actuary should also consider stresses and scenarios that may be considered more extreme in the current environment or that have not occurred in the recent past.

In determining the stresses and scenarios to be considered, the actuary should be aware that:

- Risks and exposures may exhibit non-linear, unexpected behaviour and interactions, especially under stress;
- Risk measures exhibit non-linear behaviour, especially when various individual risks are aggregated; and
- The value-at-risk measure required for calculating the SCR is not sub-additive.

For the appraisal of some risks, the projections can be on a deterministic basis. However, the actuary should consider, depending on the circumstances and nature of the risk profile, whether stochastic techniques should be used to exhibit the variability in outcomes that could take place in the future.

The actuary should document the approach used and its justification. The actuary should also set out his or her justification for the use of particular scenarios.

Reverse stress tests should be considered to identify various combinations of risks that may lead to the failure of the business, whether that failure is defined as insolvency, loss of a certain credit rating, parental difficulties or other outcome. These reverse stress tests may be more extreme than plausible scenarios.

In testing variations in the outcomes above, the actuary should allow for plausible management actions. The actuary should pay heed to stress and scenario tests issued by insurance and/or banking supervisors and other relevant bodies.

Scenario testing is in the very core of ORSA and therefore it's highly important to use as realistic assumptions in the base scenario as possible. This might be done by using models allowing also for future trends, non-fixed correlations (e.g. copulas), real world ESG data and management actions that are in line with the way business is managed. Also the assumption regarding new sales is important and helps to give the needed realism to the model; what products are being sold and how aggressively. After the base scenario is ready and modelled then the focus can be set on the scenarios.

A plausible adverse scenario is a set of adverse, but plausible, assumptions about matters to which the Company's financial condition is sensitive. Plausible adverse scenarios will vary between companies and may vary over time for a particular company. These scenarios should normally include plausible combinations of adverse developments in

multiple factors as well as adverse developments in individual factors. In constructing or reviewing plausible adverse scenarios, the actuary should normally consider the potential impact of shareholder, policyholder, cedant and broker behavior (if applicable) in adverse conditions.

One or two of the ORSA scenarios could introduce the reverse stress test. Building this kind of stress starts usually from what could be the series of events that will drive the business into a serious failure or into loss of confidence in the company by markets.

[SOME TEXT ABOUT HOW TO CHOOSE SCENARIOS… also 'Justification of the scenarios could include…']

Commented [S4]: There is now a vast wealth of scenario and stress testing material available from consultancies, regulators, international bodies (IMF, IAIS, etc). Should we make reference to it?

[SOME TEXT ABOUT ASSESSING THE NEED FOR DETERMINISTIC VS STOCHASTIC MODELLING]

ESAP 3, Seciton 3.2.2 "Qualitative risk assessment"

Combining quantitative and qualitative risks coherently

The actuary should determine which risks can and should be quantified and which cannot easily or should not be quantified. In the case of the latter, the actuary should be aware of the qualitative tools to identify, describe and report those risks and should consider whether it would be appropriate to carry out separate scenario tests to demonstrate the effect of particular scenarios on the group or entity. The actuary should ensure or contribute to ensuring, whichever is appropriate, that these scenarios are coherent and can allow for management actions. These scenario tests should include scenarios the entity can survive and which it cannot.

Consideration should be given to the ultimate use or users of aggregated risk information and how the inclusion of qualitative risks may affect this.

The actuary should quantify risks to the extent possible, taking account of the precision required for the intended purposes. Where the required precision is not possible, risks should be handled qualitatively. The qualitative measurement thereof should consider the nature of the remaining uncertainty as well as the need for precision (proportionality).

With regard to incorporating qualitative risks coherently within the ORSA:

- professional judgement should be used when incorporating qualitative risks into the ORSA or the models supporting the ORSA;
- material risks which cannot be quantified reliably should be incorporated into the ORSA using qualitative methods; similarly, when quantification of a risk is not sufficient in comparison to qualitative methods and qualitative methods manage the risk more efficiently, the actuary should use those qualitative methods for the purposes of the ORSA;
- the inclusion of such risks and exposures should not introduce spurious accuracy into the ORSA; and
- when risks could be captured quantitatively but are captured only qualitatively, then a proper explanation should be given and documented.

The actuary should document the process involved and justification for the conclusions.

Risk coverage considerations for the models supporting the ORSA methodology

The actuary should consider that there may be risks which, although capable of being captured quantitatively, are better managed using qualitative methods only. In identifying and quantifying (to the extent possible) the risks in the ORSA, the actuary should consider the risk appetite and the full risk profile of the business throughout the entire time horizon used for the ORSA projections. The actuary should also consider to what extent these risks are covered within the Solvency II balance sheet and the SCR. The conclusions of this process should be documented.

For all risks to which the underlying group or the entity has or could have during the time horizon of the ORSA, material exposures should be taken into consideration in the ORSA. For each risk, the actuary should consider the nature and level of uncertainty associated with the risk itself as well as the extent of exposure (e.g. the extent of potential losses due to changes in this risk). The actuary should consider whether to include the risk within the ORSA models. This should form part of an on-going process as the actuary's understanding of the risk changes and the nature of the (re)insurer's exposure to that risk changes.

When doing the ORSA work its highly important to understand what risks can be modelled (quantified risks) and what are those that are assumed to have no impact to the actual numbers but are assumed to be in the background or

assumed not to be materialized on the ORSA scenarios (qualitative risks). The importance comes from how the results are explained. Qualitative risks usually do bring conditions to explaining the results, etc. 'ROE was over 10% on average but it was assumed no operational risks to harm the business during the ORSA years '.

To make a distinction between which risk can be quantified and which cannot, a risk map could be used (see the appendix). Also while doing this it could be checked whether the risk is material or not for the company and in case of material and qualitative it probably might need to be noticed in the results.

Within the quantitative ORSA model it is implicitly assumed that qualitative risks don't play a part. This could be opened up for the readers with examples (company staff knows what they are doing, do get all the necessary information when putting the business plan into action, are not compensated contradictory to the strategic aim etc.)

If by reading the ORSA draft report actuary cannot say how a qualitative risk is taken into account in the ORSA the work could be reviewed from that respect or that qualitative risk left just out

It may be inappropriate to utilise continuous probability distributions for qualitative risks. Qualitative risks should be incorporated as appropriate. In some cases, it may be most appropriate to assign discrete probabilities to representative risk events. In other cases, it may not appropriate to assign probabilities at all. Consideration should be given to the ultimate use or users of aggregated risk information and how the inclusion of qualitative risks may affect this.

Risk appetite reflects the overall strategy and all the policies (underwriting, capital management, investment, etc.) which the company has for steering the business. To successfully include the risk appetite in its entirety into the ORSA model an actuary needs to ensure that the model can take into account the ways risk is taken in practice and that the model works in all the scenarios and in the modelled ORSA years. Obviously this can be an overly complex task and therefore in some cases this needs to be done by implicit assumptions done when estimating the underlying parameters.

It's also useful to get a good picture of the risk profile (e.g. by doing a risk map, SEE appendix YYY). Taking the one used in solvency II gives a good starting point but after a good understanding about the business practice and the company's risk appetite is gained its really useful to re-think the risk profile and find out whether all the material business risks is taken into account. In the ORSA process it's crucial to find those risks and exposures which affect the company materially in relation to the key performance indicators the company measures itself with (e.g. ROE, change in solvency position, MCEV change) because these are of interest of the main stakeholders the company has. A list of the possible material risks could also be done to help not to leave some important ones out of the model. This kind of list could cover lists like:

Considerably macro-economic changes globally or in national level

The main 'game changers' for the industry

Changes in customer behaviour and consuming patterns

…

After all the work with the risk profile, it needs also to be checked that the used quantitative models allows for these exposures, either explicitly or implicitly.

Commented [S5]: Yet unstructured thoughts.

Ensuring difficult-to-quantify risks are incorporated in the ORSA

Material risks which are difficult or impossible to quantify should be incorporated into the ORSA using qualitative methods regardless of:

- whether reliable probabilities can be assigned to various outcomes, e.g. via discrete probability function or continuous probability distribution,
- whether the whole range of outcomes can be understood, or
- the extent to which the company's exposures can be measured accurately.

Somewhere there could be thoughts of some risks being difficult to quantify but it still being relevant to have capital to cover risks – or the other way round, risks being possible to quantify but being treated (at least depending on the time horizon) with something else than capital.

The difficulty in assigning a probability to a given scenario (e.g. removal of compulsory purchase annuity in the UK prior to the 2014 budget announcement) should not prevent the scenario being included as a stress test, in order to understand the effects on the business.

Scenario testing and “what-if” testing do not necessitate precision in measuring a company’s exposures to an area of uncertainty which is difficult to quantify. If the uncertainty is difficult to measure or if the exposure thereto is difficult to ascertain, an approximate (back-of-the-envelop) calculation may suffice. Also, such approximations may be reduced over time as the company’s understanding of the risk or the exposure evolve/increase.

While it is desirable to understand all possible outcomes relating to an area of uncertainty, it may not always be possible. Incomplete understanding of a risk should not preclude its inclusion in the ORSA.

There are a handful of ways to coherently incorporate quantitative and qualitative risks and exposures. This EAN could refer to some of those.

Section 3: other relevant subjects removed from ESAP 3 early drafts

- Understanding and documenting the key similarities and differences between the real world and the modelled world from an ORSA point of view (i.e. the world implicitly assumed within the model(s) supporting the ORSA)
- Entity interactions with business processes and business units
- The ORSA run: set-up, reproducibility, and documentation
- Processes for design, use and monitoring
- Communication and consultation with stakeholders
- Review and update of appropriateness of methodologies, model structures and model output, including risk coverage of the model(s) supporting the ORSA methodology and emerging risks
- Review and update of users and uses of the ORSA output and the suitability thereof considering the difference between real world and modelled world
- Risk management and the ORSA
- Special issues specific to group ORSA
- Effectiveness of the model(s) supporting the ORSA methodology as a risk management tool

Understanding and documenting the key similarities and differences between the real world and the modelled world from an ORSA point of view (i.e. the world implicitly assumed within the model(s) supporting the ORSA)

The actuary should evidence his or her understanding of (and document) the key similarities and differences between the real world and ORSA model.

Real world vs. modelled world needs to be opened in EAN:

The risk map with the included qualitative and quantitative risks and the excluded risks sets the scene for this. Risks which are excluded are by definition something out of ORSA but can also be justified to be this way.

Also some models might capture the real world event more realistically than others and this need to be explained (equity and interest rate models, consumer behaviour etc.)

In considering this the actuary may wish to consider:

- the appropriateness of the risk measures used;
- the appropriateness of the risk modelling, especially where the modelled risk may differ in nature from its counterpart in the real world, and what this means for the ORSA;
- the stresses and scenarios used and the appropriateness of the results;
- management actions assumed as mitigating factors, their associated time delay and any track record of their effectiveness;
- the appropriateness of the model to the risks of the Company;
- the risks not covered by the model;
- the reasonableness and robustness of the business assumptions underlying the base scenario used for the projections; and
- whether there are any concerns over the appropriateness, completeness and accuracy of the data used and document the reasons of use professional judgement.

Entity interactions with business processes and business units

Where the actuary has a material involvement in ensuring wider business participation in the ORSA process, he or she should take reasonable steps to work with relevant business units to identify, understand, quantify or qualify, monitor, manage and report on all the identified areas of uncertainty and the exposures so that these can be properly considered in the ORSA. The actuary should record their interactions with these other business units and may recommend how these interactions could be improved.

There should be a coherent link between the ORSA, the strategy of the entity (as reflected in the output of the business-planning process), and the decision-making framework.

The actuary should liaise with the risk owners (within relevant business units) in any risk profile assessment considering the risk appetite, risk tolerances and limits, and the organizational structures of the business units for the time horizon of the ORSA.

The actuary should be clear about the level of materiality they are working to and why that level is appropriate. Where the work concerns a particular business unit, the actuary should also consider that, from the group perspective, materiality may not be the same as from the perspective of the business unit locally.

The actuary should consider, where applicable, whether risks in relation to the undertaking and its major branches should be first assessed individually and then aggregated or if they should be assessed as one unit.

The actuary should seek to ensure or contribute to ensuring, whichever is appropriate, that the AMSB takes an active part in the ORSA process by, for example, steering how the assessment is to be performed and challenging its results.

The implementation of ORSA should be consistent with the Business Plan used by the group or undertaking and the Business Plan should consider the risk appetite, the expected and stressed risk profile and the cost of capital generated as elements for the strategy definition process.

The actuary should document his or her interactions with the business units and business processes. He or she should note the areas where interactions could be improved and where further information would be helpful.

It's important the business aspects, and so, ensure to optimise the risk position and achieve a good capital efficiency. This involves analysing:

Some risk owners

Identifying your business opportunity – position relative to competitors/market share, identifying growth targets, understanding your performance measures to align strategy and risks;

- *Distribution – Looking to the risk involved if there is a lack of information/transparency in the sales process;*
- *Product design – Identifying and assessing the risk that can be involved in the products, for example unprofitable products, legal and environment risks;*
- *Underwriting – Identifying, assessing and monitoring in the process of ORSA, the risk exposure of the underwriting and the future underwriting decisions;*
- *Pricing – Risk pricing and commercial strategic deduction;*
- *Reinsurance – Risk involving reinsurance arrangements;*
- *IT – assess risk involving data quality, systems/models;*
- *Investments - Identifying investment exposure, analysing risk mitigation strategies;*
- *Portfolio Valuation - monitoring the risk involved in portfolio valuation and analysing the provider of asset data (internal or external);*
- *Claims management – identifying, assessing the claims management and monitoring the risk involved.*
- *Risk appetite*

Defined the amount of total risk exposure that an organisation is willing to accept or retain, usually it is expressed in qualitative terms, but clear risk metrics have to be in place to capture risk appetite, formulating possible risk criteria:

- *Minimum and maximum solvency ratio;*
- *Target debt rating;*
- *Capital/earning at risk.*

It isn't a static statement, risk appetite has to have a regular reviewing process

Business strategy

Business strategy has to be incorporated into risk process and vice versa. The ORSA is a mean by which insurer can bring together their risk management activities and use the information to support business decisions.

Key risk indicators – it's important that companies develop simple risk indicators which are linked to the capital requirements;

Time horizon – It is important to ensure risk framework is projected over the business plan horizon;

Business plan - companies will need to understand the implications for the capital position of the business planning process which look at new business sales, it should be tested under different risk scenarios to understand if the company has sufficient capital;

Proportional risk identification – the complexity of the organisation will determinate the sophistication of the process, in reality, focus should be in the high-level messages on how the risks carried by the company may unfold over time and a description that the senior management could take in reaction to potential adverse events.

The ORSA run: set-up, reproducibility, and documentation

The actuary should review the scenario and projection process in order to form a view on the extent to which the ORSA run can be achieved within a periodic, annual or more frequent, ORSA cycle or upon an ORSA-triggering event. The actuary should review this triggering event and how it is defined and regularly monitored.

The actuary should ensure or contribute to ensuring, whichever is appropriate, that the following documentation on the ORSA is in place:

- the ORSA policy;
- the record of each ORSA cycle in such detail that, together with the ORSA policy, the material methods, assumptions and results are captured; and
- the ORSA report, or reports if there is a difference between the internal report and the supervisory report, suitable for decision-making and follow-up.
- The ORSA report should include at least the following:
- identification of the risk profile;
- assessment of the overall solvency needs and stress test for principal risks in a forward-looking perspective in light of the risk appetite;
- reconciliation of the overall solvency needs with the regulatory capital requirements, if relevant;
- compliance, on a continuous basis, with the capital requirements;
- deviations from assumptions underlying the SCR, if relevant;
- analysis of deviations from previous evaluations of the same year; and
- professional judgements used and the reasons for them.

The ORSA has to be a tool of management on the organization and not only something, that company does to the supervisor.

Setting up ORSA scenarios

In setting up the scenarios for the ORSA, the actuary should use:

- Scenario testing – The use of scenario testing helps the responsible for running the business to understand, the value of the impact of real life events can have in the business, and test how the company can respond in such situations.
- Reverse stress testing – Such scenarios encourage the organization to think more widely about scenarios that could lead to a failure, for example, scenarios that could cause the market to lose confidence in its ability to write new insurance business. The reverse stress test play a key part in the strategic planning of the company and in the ORSA process, because it questions the viability of the business model.
- Stress testing- The use of stress testing helps to assess the impact of some crash on the robustness of the Company.

Reproducibility

[text]

Documentation

To support an ORSA, documentation will be required, such as ORSA policy, ORSA process, ORSA report, but for the ORSA to be used by the senior management there should be a focus on developing a slim-line report with a high-level explanation of how risk are managed within the business, this report could follow a cascade structure and should be linked to the other reports.

Processes for design, use and monitoring

The actuary should evidence that he/she has considered the following items when designing, selecting, using/applying, communicating and monitoring ORSA processes:

- the need for the ORSA process to be aligned with the business-planning process including the consistency of the risk profiles considered;
- the need to have appropriate processes to identify and monitor changes in the risk profile;
- the need to have triggers for detecting significant change in the risk profile of the entity or group that requires a recalculation of the SCR;
- the need for the scenarios that are developed, applied and updated to be appropriately adverse but realistic;
- the need for the ORSA process to yield itself to verification/review/audit;
- the need for processes that allow for regular updates to the ORSA;
- the need to develop and maintain an ORSA policy; and

the need for all information required by law and by the ORSA policy to be dealt with proportionately and appropriately in both the internal and the external ORSA reports.

Communication and consultation with stakeholders

In applying the ESAP 1 section 4 Communication:

The actuary should ensure or contribute to ensuring, whichever is appropriate, that the ORSA consists of a cycle of sub-processes and should be designed in a way requiring data and opinion from all relevant units of the undertaking or group.

The ORSA is primarily intended to help decision-making by the AMSB and/or senior management and therefore the main intended users of the work will be the AMSB and/or the senior management of the undertaking or group.

The risk culture should be disseminated across the organization, it is therefore important that the risk information is presented in a way that facilitates understanding from different parts of the business.

Dashboards with early warnings indicators, for example, could be used to indicate if the actual risk exposure is out of the limits define, according with the risk appetite of the company. This will allow management to take necessary risk mitigation actions to bring exposure back.

Review and update of appropriateness of methodologies, model structures and model output, including risk coverage of the model(s) supporting the ORSA methodology and emerging risks

The actuary should review and update the appropriateness of the ORSA process, including:

- the ORSA policy;
- the applied methodologies;
- model structures;
- data used;
- assumptions made, including any management actions;
- scenarios designed;
- model output and reports; and
- any other shortcomings.

Where relevant, the actuary should seek feedback from all relevant units of the entity focusing on the input from the AMSB and/or senior management. The result of the actuary's review should be documented.

Review and update of users and uses of the ORSA output and the suitability thereof considering the difference between real world and modelled world

Throughout the ORSA cycles, the actuary should evidence that he or she has considered:

- the previous ORSA and real world developments;
- feedback from users of the ORSA, especially if recommendations approved earlier have been implemented properly;
- to what extent the results of the ORSA have been used in decision-making;
- the implications of the changes in relevant factors affecting the users and uses of the ORSA output, such as consequences of the changes in the organization, responsibilities, management information systems and risk appetite; and

the tolerances and limits versus the risk profile of the undertaking or group, overall and in the relevant segments.

Risk management and the ORSA

Where an actuary with a material involvement in the ORSA process has reasonable grounds for believing that there are material inconsistencies between the ORSA and risk management within the entity, he or she should consider documenting such inconsistencies.

In considering the materiality of any such inconsistencies, the actuary should have regard to:

- the extent to which the risk management strategy and the day-to-day risk management practices are reflected in the ORSA;
- the extent to which any current risk management actions may be contraindicated or be inefficient relative to the assumptions of ORSA or its output;
- the extent to which the Enterprise Risk Management (ERM) framework is incorporated, supported, and consistent with the ORSA or its outputs; and
- the appropriateness of the ORSA process.

Special issues specific to group ORSA

For the group ORSA, the actuary should ensure or contribute to ensuring, whichever is appropriate, that:

- the scenarios are consistent across the group;
- there is proper allowance for fungibility constraints and tax issues;
- specific risks within subsidiaries and branches (but which are not group wide) are covered;
- risks in business units which are:
    - non-regulated;
    - regulated outside the Solvency II scope but in jurisdictions deemed equivalent to Solvency II; or
    - regulated outside the Solvency II scope, in jurisdictions not deemed equivalent to Solvency II

  are covered properly; and
- allowance is made for implied guarantees on subsidiary capital.

Effectiveness of the model(s) supporting the ORSA methodology as a risk management tool

Commented [S6]: Draft of this section is incomplete.

Where an actuary has a material involvement in the ORSA process, he or she:

- should consider the extent to which any model materially supporting the ORSA methodology is effective as a risk management tool; and
- where they have reasonable grounds for believing that the model is not effective, should document their concerns and the reasons for them.

In considering the effectiveness or otherwise of such a model, the actuary should have regard to:

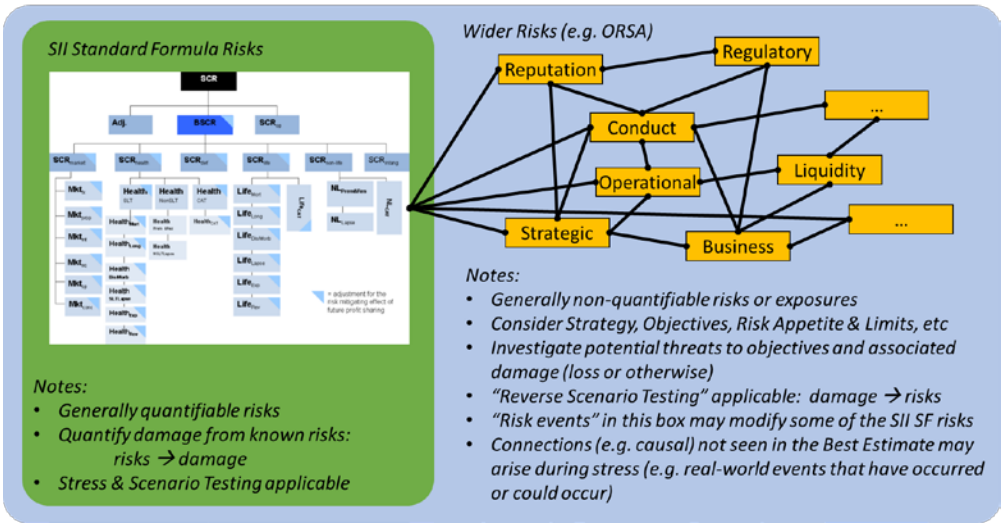
- how the ORSA provides useful information to decision-making; and
- the extent to which the ORSA supports the ERM framework

The actuary may also have regard to areas where it might be worth improving the ORSA methodology in order to increase the effectiveness of the process.

Appendix

Commented [S7]: Material beyond this point requires a better structure…or deletion

Risk MapsRisk/Damage Map



ORSA Risk Coverage Map

[Useful diagram for actuaries, list which is nearly exhaustive but also succinct and usable]

Appendix 1: interactions and dependencies of risks and risk exposures

Risk "Dependencies" under Solvency II Standard Formula and (Partial) Internal Models

Within the SII Standard Formula, risk exposures (monetary loss amount by risk module) are aggregated by a prescribed two-tier set of covariance matrices. There is an important distinction here: these are covariance matrices used to sum (sum of squares) single risk exposures, they are not fit-for-purpose correlation matrices ready for stochastic simulation (e.g. via ESG[5] or RSG[6]). The two-tiered approach of summation does not work for stochastic simulation.

For stochastic simulation within a (partial) Internal Model for SII, there are various ways to produce stochastic risk simulations (events or changes) and risk exposures (losses). A few of the approaches are described briefly here. For ease of reading we'll use the term "gains (losses)" in lieu of "exposures".

Approaches to Risk Dependency Modelling in (Partial) Internal Models

Risks, Copula, Gains (losses):

All risks are modelled stochastically via a RSG which utilises a single comprehensive dependency structure (copula or correlation matrix) or a combination of copulas, correlation matrices and a causal map (Bayesian Network) which

[5] ESG = Economic Scenario Generator, a set of stochastic simulations of market risks

[6] RSG = Risk Scenario Generator, an expanded ESG which produces coherent stochastic simulations for non-market risks, e.g. surrenders, deaths, operational risks.

combines in a coherent manner (1) all risks not covered by a copula or correlation matrix and (2) all risks covered by a copula or correlation matrix.

Stochastic risk simulations (values) are produced first. Next, gains (losses) are modelled using either the company's liability or ALM models (if computationally feasible) or some form of proxy model[7].

Losses from all relevant policies and areas of risk (under SII SF/IM) are then "aggregated"--summed within each individual simulation. These single-simulation aggregate losses are "aggregate" in that they represent the full loss in the simulation for the entity in question, e.g. the insurance group, a subsidiary or a single fund. The aggregate losses are then ranked for highest loss to lowest loss (possible a gain). The SII SCR is calculated as the 0.5th (1-in-200 or 99.5th, depending on order) of the ranked losses.

Copula, Gains (losses):

In some cases, for example "reserve risk" for some general insurance products may be modelled via a distribution of the losses without reference to an underlying risk which causes these losses. Simulated and aggregate losses and SCR capital are determined as above.

Combined model:

In some cases, the SII IM may have a subset of losses such as "reserve risk" which are not driven by distinct risks as well as a subset of well-defined risks (as described above in #1). In this case, the dependency structure should accommodate both subsets. Coherence is left to the actuary. The term "coherent" is clarified in the next section.

Coherent Combination of Continuous and Discrete Distributions

When the realisation of a risk or area of uncertainty may take a value from a limited (finite) number of possible outcomes, this risk has a finite "sample space" and the most we can hope to do is assign discrete probabilities to each possible outcome in the sample space. Because the outcomes are distinct (e.g. with compulsory purchase of annuities in the UK pre-2014, either the state of the world was "yes" or "no"), it is inappropriate/impossible to assign a continuous probability distribution.

In the case where the ORSA involves "continuous risks" and "discrete risks", care should be taken when assuming or defining dependency among risks, especially between the two aforementioned camps.

A good example is thinking about the general business environment. There are many conventions which determine how we do business, how consumers buy things, which things they buy, which things they are obliged to buy, how competitors behave, etc. Changes in any of these areas may pose a risk to insurer. These are examples of "discrete" risks—the base ORSA sensitivity should be based on the expected future business environment (probably similar to the current one), with sensitivities varying certain aspects which may change in the future (e.g. emerging risks). This collection of "business environment discrete risks" likely have a cause-and-effect relationship with the standard SII SF or IM "continuous risks" where changes in the business environment may cause changes in the standard SII SF/IM risks (e.g. policyholder surrenders). One coherent method to allow for such dependencies is via a causal model, aka Bayesian net.

Care should be taken if combining "continuous risks" and "discrete risks" within a stochastic (e.g. Monte Carlo) capital model. It may not be possible or appropriate to include certain "discrete risks" within a capital calculation.

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[7] "All models model something; however, it is useful to distinguish between those models which approximate reality and those which simply approximate a more complex model. The distinction of a proxy model, therefore, is that it models another model." UK Actuarial Profession Proxy Model Working Party, http://www.actuaries.org.uk/documents/heavy-models-light-models-and-proxy-models-working-paper

Proxy models aim to replicate a given risk metric (gain/loss, cash flow profile, change in Basic Own Funds, etc) that would be produced by the company's normal liability or ALM models ("heavy models") under a variety of risk stresses. Proxy models include polynomial approximations, radial basis functions, Least Squares Monte Carlo, replicating portfolios, replicating polynomials, and Delaunay triangulation.
See also, http://www.theactuary.com/features/2014/04/erm-proxy-models/

That is to say, that it may not be appropriate to hold capital against some risks. There may be more appropriate recourses, e.g. adapting the business plan to deal with a possible change to the business environment, creating new KPIs or KRIs to monitor such risks, etc.

As a side note, where a risk or area of uncertainty has a continuous range in which the risk may take any value, or is effectively so, then it may be appropriate to incorporate this risk via a continuous probability distribution function. Temperature, sea-level and equity prices are examples of such areas of uncertainty where an "event" may take any value from a given range. This is a discussion of when this is the case but the distribution function is not well-known.

Aggregation for SII Standard Formula and (Partial) Internal Models

[TBC]

Reference: The Institute for Risk Management's Internal Model Industry Forum "Diversification Benefit: understanding its drivers and building trust in the numbers", Appendix B

Risk "Dependencies" for the ORSA

For the ORSA, in order to bring in the additional ORSA risks or exposures (within the ORSA, but not the SII SF or IM) an addition is required to each of the risk dependency modelling approaches above. Where the additional ORSA risk or exposure is readily quantifiable, it may be incorporated within the existing risk dependency model. Where the ORSA risk or exposure is either not readily quantifiable, understood via discrete probabilities, or not able to be assigned continuous nor discrete probabilities reliably (hereafter **non-quantifiable risks or exposures**), then in this case the SII SF/IM risk dependency modelling approaches should be expanded in order to incorporate the ORSA risks or exposures.

The goals of incorporating ORSA risks or exposures may include:

There are coherent[8] methods for incorporating **non-quantifiable risks or exposures**, depending on the objective, purpose, or desired risk metric:

- Stress and scenario testing and reverse stress testing (SST)
- ORSA capital, if appropriate
- Capital allocation, if appropriate
- [more]

Causal Relationships:

Understanding cause-and-effect relationships among ORSA risks and SII SF/IM risks, if such relationships exist.

That is, understanding how changes in the ORSA risks may change either the SII SF/IM risks, the dependencies among those risks, or the exposures to those risks. For example, damage to the insurer's reputation may affect the amount of future new business as well as policyholder persistency (lapses and surrenders).

Put another way, understanding how changes in the ORSA risks or exposures change the Best Estimate assumptions driving the SII SF/IM calculations (call this the "adjusted Best Estimate").

Aggregation of Risks, Losses, and/or Capital:

Understanding potential losses arising when combining ORSA risks or exposures with the collection of risk/exposures/losses from the SII SF/IM

[8] The word "coherent" requires explanation: a model of risks or exposures is considered to be "coherent" if (1) the model itself is a reliable representation of the real-world system or situation being modelled and (2) the input assumptions and parameters form collectively a valid view of the world. In other words for (2), that they form a potential, realistic view of the world itself (and as modelled) in which no two assumptions or parameters contradict. Taken one step further, a model is coherent if it does not otherwise contradict beliefs or assumptions held as true. For example, a model of the trajectory of a thrown ball could not be coherent if it disobeyed gravity.

ORSA risks or exposures may produce losses which are isolated from other ORSA risks and those risks within the SII SF/IM. It is then a question of how these ORSA losses should be aggregated with the SII SF/IM losses or capital, if at all.

In order to incorporate **non-quantifiable risks or exposures** within a stochastic risk or capital model, one could assign a discrete probability function (pf) or continuous probability distribution function (pdf) in order to sample the ORSA risk or exposure randomly and hence feed into the risk aggregation of the larger stochastic model. **THIS SHOULD NOT BE DONE**. This would introduce spurious accuracy, the potential for errors, the potential for misuse or misunderstanding of the risk downstream, and would ignore the very nature of the **non-quantifiable risks or exposures**. That is, It is likely inappropriate for **non-quantifiable risks or exposures** to be incorporated within a stochastic risk or capital model by assigning discrete probability functions or continuous probability distributions (where these are not already assigned reliably).

Stated differently, stochastic methods should not be used blindly for **non-quantifiable risks or exposures**. Stochastic methods include: risk dependency modelling, risk/loss aggregation, and risk capital allocation. The actuary should consider whether the output of such stochastic methods would still be fit-for-purpose as well as how the risk information could be misused or misunderstood downstream after having incorporated the **non-quantifiable risks or exposures**.

Other considerations for risk and capital

Determining Risk Capital for ORSA risks or exposures:

May or may not be appropriate to hold capital (find Lauri's comment)

The actuary should decide…here's a bit of guidance…

Allocation of Capital:

[TBC]

Risk Metrics, e.g. Risk-adjusted Return, etc

[TBC]

ORSA Risk Coverage

[Lauri's risk map; "damage map"; map of SII risks, SII tree, ORSA risks, emerging risks]

Emerging Risk

[TBC, or removed]

Effective Maintenance and Sharing of Knowledge

[TBC, or removed]

Unsorted, additional notes

Certain assumptions, in particular those which are a consequence of the economic environment, are best treated as a group. The Company's ability to withstand a period of inflation or recession, rising or falling stock markets, increasing market sizes or increasing competitiveness, should normally be investigated using coherent sets of assumptions. Where non-economic assumptions are expected to react in a certain manner to changes in the economic environment, these changes should be incorporated into the combined scenario.

[1] Testing groups of assumptions which are assumed to change in a related way is sometimes described as "scenario testing", whereas varying individual assumptions independently is typically referred to as "sensitivity testing". Stochastic modelling will normally incorporate the scenario concept by assuming specific statistical relationships between variables, such as inflation and investment returns.

[3] (e.g. assets, lines of business, distribution channels, geographical). Where there is a significant risk concentration, the actuary may wish to carry out additional research into this area when determining the appropriate stresses and scenarios.

[4] Where there is potential non-linearity in outcomes, the actuary should consider what stresses and scenarios trigger severe losses (cliff-edge effects). For instance, this may apply to options that are "out of the money" or successive events which could lead to significant losses (e.g. change in mortality basis followed by changes in interest rates for annuities).

[5] Stochastic techniques may also be valuable in comparing the relative level of probability of adverse circumstances occurring.

The actuary should be wary of potential biases in choosing and reviewing stresses and scenarios. That is, the actuary should not necessarily restrict stresses and scenarios to those that:

- do not exhaust available capital;
- are "linear" (ignoring events such as changes to the shape of the yield curve or the mortality curve);
- repeat recent events (i.e. within the last generation); and
- relate to current investment and economic issues.

However, the scenarios should remain plausible.

[6] A guide to the plausible management actions can be taken from the criteria covered in the Commission Delegated Regulation. This list is not exhaustive, and the actuary should consider other risks which are likely to materially impact on the group's or Company's financial stability or have done so in the past

Appendix 2: Deviations from Solvency II methodology

This appendix provides details of potential deviations from the Solvency II methodology which may be appropriate to use within the ORSA.

Differences in methodology

1) Risk measure: VaR, CVaR, TVaR, burn-through, long-term ALM & liquidity, etc

The undertaking may decide to use something other than the 1-year 1-in-200 likelihood Value-at-Risk measure of Total Balance Sheet risk. There are four components here which are specified by Solvency II which the undertaking may decide to adopt or change to suit its needs in managing its business and its risks: confidence level, timeframe, risk measure (e.g. VaR), and extent of exposure (e.g. the SII total balance sheet or a subset which only protects policyholders, but not PVFP).

The undertaking will likely use the SII risk measure (1-year, 1-in-200 likelihood VaR) for its SII SCR capital and may which to use this as well within the ORSA. The undertaking may wish to supplement or replace the VaR with a measure of risk which suits its business and strategy, its risks and risk management policies and objectives, and its capital policy. The risk measure (VaR, TVaR, etc) should support the undertaking's approach to capital allocation, be that implicit or purposeful, as is reflected in the business, for example in the pricing of various insurance products, as used in remuneration, or as used in assessing profitability. That is, the return on capital, is used, should reflect the manner in which capital is allocated within the undertaking.

The undertaking may also wish to vary the confidence level or likelihood of the stress, e.g. the 99.5th percentile adverse stress. This may arise from the undertakings desire to attain or maintain a certain credit rating. However, there may be non-trivial interaction of risk as viewed by the credit rating agency compared to risk as viewed through Solvency II.

The "Total Balance Sheet" approach is discussed below in #4.

2) *Risk measurement time frame: 1-year, 1-day, 5-year plan, policy lifetime, etc*
The undertaking may utilise different risk measurement timeframes within its business, e.g. daily or weekly market risk VaRs, and risks may be viewed on a shorter or longer timeframe than one year. For example, the undertaking may also focus on, for example, the risks over the same timeframe as its five-year strategic plans, or on a timeframe more suited to the nature of its products, which may differ among portfolios.

3) *Projection basis: what is Best Estimate and why?*
This is a question of what comprises the undertaking's true view of reality. From the collection of assumptions arising from Solvency II, IFRS, local accounting, etc, the actuary may be able to produce an objective "smorgasbord" best estimate set of assumptions, taking aspects from each paradigm as appropriate. The undertaking may opt to use this objective best estimate in two manners: inside and/or outside the SII capital and reserving model.

When used within the SII capital model or within the ORSA, the undertaking may wish to incorporate the objective best estimate in lieu or in addition to the standard SII SCR (Standard Formula or Internal Model per Pillar 1). In this sense, the capital model is comparable to the SII SF or IM.

When used outside the SII capital model (Pillar 2), the undertaking may wish to perform projections into the future of various balance sheets and profit and loss accounts, e.g. SII, IFRS, local GAAP. In this sense, the objective best estimate should be used to move from the valuation date (broadly "the present") to the point in time when the accounts are to be modelled. That is, the objective best estimate should be used to arrive at the future point in time at which, for example, the SII balance sheet is modelled. In this manner, the objective best estimate should feed into the future assumptions bases (as required by regulation) for each set of accounts to be projected into the future. In this sense "outside the SII capital and reserving model", the objective best estimate may be thought of as the "outer scenario" analogous to a stressed ORSA scenario. Moreover, as within a stressed ORSA scenario, the future Best Estimate (e.g. SII BE) should take into account the experience or assumptions leading up to the point in time when the "inner scenario" assumptions are required. For example, in a scenario where mortality is reduced by 10%, this should inform the setting of the mortality (and longevity) basis for the calculation of the SII balance sheet as at, for example, five years into the future.

It should be clear what the real-world, BE assumptions are that feed into the ORSA. That is, within the ORSA, reserves and capital should be projected consistently with the Transitional Measures, if being used. In order to do this, the company will be projecting Solvency I as well as Solvency II reserves and capital within the ORSA (consistent with SI/SII assumptions).

However, Solvency I and/or Solvency II assumptions driving the above reserves and capital calculations may differ from what the company chooses to use as the assumptions underlying the ORSA model(s) and process.

For the best estimate ORSA scenario, the (re)insurer may choose the ORSA assumptions to be of the following, noting that the best estimate should be fully justifiable:

- Fully consistent with SII BE assumptions; or
- What the (re)insurer expects on an objective best estimate basis—the "true real-world basis". This may mean that some assumptions are the same as the Solvency II basis while others differ. When they differ, the actuary should explain why.

It is vital to keep in mind the realities—in addition to and as opposed to SII modelling, SF/IM, prescribed assumptions, e.g. in SII MA—when evaluating risks, potential risk events both at extremes and as expected, the distribution of risk events (if appropriate), exposures to those risks, as well as related things such as management actions, regulatory actions, and policyholder behaviour.

A vital aspect related to the discussion above is that the actuary should understand the differences, both individually and in aggregate, between the Solvency II principles and rules and any deviations appropriate for the ORSA.

[additional thought: what's more appropriate for a market/asset BE: an assumption that we run through the forward term structure or a continuation of a trend? Note that the two may be inconsistent, and we may commonly take assumptions for different parts of the market from different underlying assumptions. E.g. run through the forward term structure for interest rates or yields, while for returns we continue with a trend or the future expectation of trends. In today's market, that the forward term structure does not become reality may be due to changes in the central bank rate and the money supply (QE, etc), both of which have supported the trend in returns, but may invalidate the assumption of running through the forward term structure. On the other hand, running through the forward term structure may be akin to assuming book value run off for all assets (easy for bonds and credit, not for equities, etc).

4) *Total Balance Sheet approach to risk capital versus policyholders' protective risk capital*
Solvency II takes a "total balance sheet" approach to evaluating an insurance company and its risk. The total balance sheet (TBS) approach incorporates risks from the perspective of various stakeholders, notably policyholders, shareholders and debtholders. The TBS approach aims to assess the risks to the viability of the insurer by evaluating the nature and behaviour of the underlying insurance risks on a market values basis for both assets and liabilities. For an insurer, different risks affect different components of the Solvency II Balance Sheet, depending on the nature of the insurance policies, the assets, the approach to ALM, etc.

An undertaking's risk exposures may be understood by looking at how each risk affects the components of the SII Balance Sheet and how each risk affects the SII capital components. Risk exposures to shareholder capital are different from exposures to future profits through the nature of the capital held, whether additional capital might be required to be injected, what such capital protects and how certain risk exposures are managed.

An undertaking's Own Funds (capital) may include shareholder equity, future profits (PVFP), and subordinated debt. Both shareholder equity and sub debt have the capacity to absorb losses on existing business when such losses require an injection of capital or a transfer of capital to policyholders to meet a shortfall of assets backing liabilities. PVFP is a measure the future profitability of the business and generally does not provide for capital injection. Moreover, capital protecting PVFP generally protects the balance sheet (and hence shareholders and debtholders), but does not protect policyholders directly.

PVFP generally protects the business against business and operational expenses and risks not directly connected to policyholders. It keeps an insurer in business and is what will provide for future salaries, business costs, dividends and debt service, should any of these exceed the Best Estimates already implicit in the Solvency II framework. Within the projection of the business, future profits materialise, if available, and then belong to shareholders, being distributed as dividend or retained as working capital. Shareholder equity and sub debt protect against losses not supportable by future profits and protect policyholders in the short term should the insurer have insufficient means to meet its liabilities. The sub debt is subordinated to policyholder liabilities.

In summary, different risks affect the components of Own Funds differently and the components of Own Funds protect the business from different risks over different time frames. Hence, within an undertaking's business practices, it is possible to treat different risks and capital components differently. For example, an undertaking's internal view of required capital could focus solely on risk capital which protects policyholders (and not PVFP). Alternatively, the undertaking could apply different risk metrics to different capital components, e.g. a 1-year 99.5th VaR for policyholder protective capital and a 1-year 97.5th VaR for PVFP protective capital. Moreover, the undertaking may wish to distinguish how these distinct risks are managed or how their allocated portions of risk capital are managed or invested.

[more]

[preface—policyholder protective capital perspective + potential issues with "going concern"] From another perspective, for a given portfolio of in-force insurance business, it may be useful to consider the total assets available to pay those benefits, with or without the allocated risk capital, *but without PFVP, VIF or goodwill* especially as arising from other product portfolios. Considering asset-liability "matching" from this perspective should help the actuary identify and assess potential reinvestment risks (as well as all other common risks)

without muddying the assessment by including SII capital arising from PVFP or from future premiums on existing business or new business. [more…]

This type of analysis may suggest that after a shock, loss-making business may be subsidised by profitable business (going concern). However, this assumption of cross-subsidy should be reviewed, especially given the total level of profit (return on capital) across the business—primarily because the amount of cross-subsidy may not be maintainable as competitors or new entrants may be able to offer similar profitable products *but will not need to subsidise loss-making legacy business*. For these reasons, the actuary may wish to assess the reserve and capital adequacy of a given portfolio of liabilities and corresponding assets although this does not form the basis of regulatory reserves and capital.

5) *Fungibility of capital*

From EIOPA[9]:

> "Fungibility at group level means that an element of own funds can fully absorb any kind of losses within the group, regardless of the undertaking within which those own funds are held or where the commitments arise (in compliance with the local prudential and legal rules). Fungible own funds in this sense are thus not dedicated to a certain purpose. Fungibility of own funds at solo level doesn't automatically imply fungibility at group level.
>
> "Transferability refers to the ability to transfer own funds from one undertaking to another within the group. Transferability leads to increase/decrease of own funds in a solo entity without increasing/decreasing the group own funds, except the likely cost of the transfer. The time and the costs of the transfer have indeed to be taken into account."

Within the ORSA, the fungibility and transferability of capital, and funds more generally, within a solo undertaking among business units or liability portfolio, or within a group undertaking, should reflect the reality of the undertaking including at least the appropriate local legal, local accounting and regulatory aspects.

6) *Granularity of risk and the level of diversification among risks, products, portfolios, business units and legal entities*
Diversification among risks and among portfolios or entities should reflect the real-world fungibility and transferability of capital. For example, where capital is not transferable outside a particular portfolio, the diversification at the level of that portfolio should be the minimum capital amount as seen from a more aggregated level of the undertaking.

7) *Nature of stresses: isolated stresses + aggregation vs causal SST vs combined stresses*
For the purposes of calculating the SII SCR, he SII SF SCR calculates the amount of required risk capital via the two-tier covariance aggregation of isolated, single-risk stresses. A Monte Carlo SII IM may perform multi-variate risk stresses where the severity of individual risks is jointly sampled according to a dependency structure (e.g. copula). The SCR is then taken by ranking the Monte Carlo Simulations at the correct level of diversification and taking the capital needed for the 99.5th adverse event (or interpolated to the 99.5th percentile).

For the purposes of the ORSA, isolated stresses do not suffice. Stress and scenario tests (SST) are required. SST should include combined-risk events. The undertaking may wish to adopt a framework to develop combined stresses. This may be either ad hoc or causal[10], or both.

Similarly, if a causal model is sufficient for the ORSA, it might also be appropriate for the SII SCR.

8) *Risk-neutral Economic Scenario Generator (ESG) implementation*
The SII guidance for the implementation of a stochastic asset model (ESG) requires that the SII discount curve, with or without volatility adjustment or matching adjustment and with the last liquid point and ultimate forward rate, is used as the "risk-free rate" within the ESG which drives the other random asset processes (i.e. the SII discount curve is the "short rate"). This requires careful adjustments to market data (volatilities and market prices) to ensure risk neutrality and correct discounting.

[9] https://eiopa.europa.eu/CEIOPS-Archive/Documents/Advices/CEIOPS-L2-Final-Advice-Group-solvency-assessment.pdf
[10] https://bankunderground.co.uk/2015/09/21/bringing-together-stress-testing-and-capital-models-a-bayesian-approach/

An alternative implementation could use the market risk-free rate (without LLP, UFR, MA or VA) as the short rate to drive the other asset processes. This simplifies calibration and minimises error. In this implementation, the Solvency II discount curve (or all of them, if using MA for some liabilities and VA for others) could be calculated formulaically within each simulation from the market risk-free curve. The VA, MA and UFR are non-market-consistent adjustments arising from SII which should not be used as the stochastic risk-free reference point for other assets. The SII curves are discount curves.

9) *BEL assumes risk free (MA&VA relax this a bit), SII capital addresses the risks, but some BEL > Economic BEL*
On the overriding assumption that liabilities are cash flow matched with risky assets on a net basis (net of expected defaults and net of asset-related expenses), then this portfolio of assets could be viewed as an "economic BEL" as "the amount of assets required to meet liabilities on a best estimate basis." The margin in the SII BEL above this economic BEL is "economic risk capital" and within the Best Estimate projection that margin should be expected to materialise and accrue to the undertaking. The size of the margin is decreased by the VA or the MA (as the effective discount rate approaches the net yield).

On the other hand, the UFR may decrease the SII BEL below the economic BEL if there are material long-term liabilities. However, beyond the LLP, there may not be available assets to match long-term liabilities. In this case, relaxing the assumption of cash flow matching, there are liquidity and/or reinvestment risks which should be assessed.

Differences in modelling

10) Nature of the market stress model: causal vs "silo"-ed
11) Longevity-mortality model: combined vs separate
12) Longevity-mortality-morbidity(-disability) model: combined vs separate
13) Lapse model: SII simplistic, SII strict vs coherent
14) Interest rate up/down model: single model (e.g. Monte Carlo) vs "worst-of" two stresses model

15) Interest rate stresses & the UFR, then updated IR shocks
Firstly, reality: SII SCR uses UFR – insurers would like reassurances from EIOPA that the capital regime will remain as per regulations (i.e. step down by max 15 bps each year);

Secondly, there's a need for a second (objective) basis for the management of interest-rate related risks and reinvestment risks, which is not smoothed as SII in fact is.

16) Dependencies, correlations, interactions and cause-and-effect relationships

Correlations (covariances) are prescribed for the SII SF. For the SII IM, companies may use their own correlation/dependency assumptions/models as long as they are credible. Insofar as the company believes that correlations or dependencies differ from those used for SII capital (SF or IM), the company may wish to reflect this within the ORSA.

For example, dependencies within financial markets may differ from those assumed in the SII SF.

For example, if a company uses causal models to model certain relationships among areas of uncertainty, this should be reflected in the ORSA, if not already within the SII SF or IM.

17) Loss absorbing capacity of deferred taxes

The "Adjustment for the Loss-Absorbing Capacity of Deferred Taxes" (ALACDT) can be allowed for explicitly within a *business projection model* which projects the appropriate balance sheets and profit and loss accounts into the future, as with the ORSA, perhaps on multiple bases such as SII, IFRS, local accounting as required to reliably model the company's tax reality.

[more explanation]

18) Defaults, downgrades, credit spreads, and market values: modelling needs and risk exposures (different exposures to different SII TBS components)

Differences in assumptions:

19) *Contract boundaries*

Under the SII Standard Formula and Internal Model, contract boundaries may truncate certain products in various ways.

Insofar as SII contract boundaries cause the projection of such products to deviate from otherwise economic, real-world, BE assumptions, these assumptions may be used within the ORSA to project the expected effects (profits, EOF/BOF, future capital needs, etc) of such products.

Note that at each point in time within the ORSA projection, SII capital and reserves should be calculated consistently with SII guidance, i.e. applying the contract boundaries rules. Additionally, if the company wishes to calculate reserves and/or capital on the Own Solvency Needs basis, the contract boundaries may be adjusted to reflect the company's own views of future business levels and future capital needs.

20) *Counterparty default*

Complicated (lots of data, reliable) but simplistic (1-year VaR) where you may not only be concerned with events over the next year, but over the product lifetime…

21) *Future new business*

The ORSA should reflect the company's BE expectations of new business in the future, keeping in mind that there is a funnel of doubt the further into the future we go.

The ORSA should also enable the company to understand what the effects on the company (e.g. Solvency Ratio, BOF/EOF, capital requirements) would be in various scenarios relating to new business.

It is important to note that within the future projection within an ORSA, once future new business comes onto the books (was written in the projection's past which is future as of today) it should be treated per SII Standard Formula/Internal Model rules in calculating reserves and capital.

22) *Transitional measures (equity type 1, TMTP)*

In general, transitional measures allow a (re)insurer to gradually run off legacy business which was written before Solvency II came into force and which may not be profitable on a Solvency II basis or would otherwise have required sizable capital injections on day one. While these are beneficial from a reserving and capital perspective, they may not necessarily reflect reality. This potentially necessitates three assumption bases for the ORSA: Solvency I, Solvency II, and a true real-world best estimate (to the extent that Solvency II does not reflect reality).

23) *Equity symmetric adjustment*

24) *Discount curves (UFR, LLP, VA, MA)*

The UFR determines the distant end of the SII discount curves (risk-free with or without Volatility Adjustment or Matching Adjustment). In calculating SII reserves, the UFR should be used. This includes future points in time within an ORSA projection.

However, within the ORSA, it may appropriate not to use the UFR in within the projection. For example, an economic scenario generator (ESG) used for the ORSA may not use the UFR. It is important to note that an ESG used for SII reserves and capital should use the UFR within the discount curve, which may or may not be the "risk-free" curve as discussed above. Also, if the ORSA uses inner and outer simulations (inner reflects SII assumptions, outer reflects ORSA), then the inner ESG should use the UFR while the outer may not. That is, there is a choice within the outer ESG whether to use the UFR. The choice should be explained and documented by the actuary.

25) *Sovereign credit risk: spread movements, MV movements, risk capital, etc*

The SII Matching Adjustment reduces the net investment yield on bonds by the SII Fundamental Spread. This incorporates expected losses due to credit defaults and credit downgrades. Within the ORSA, it may be appropriate to model explicitly and separately the effects (losses, economic risk capital needs, etc) of credit

defaults and credit downgrades. In a stressed scenario, credit downgrades may not cause losses in their own right, especially if the company's management actions do not disinvest, e.g. in a global market stress.

SII assumes the sovereign debt will not default. Financial markets and companies may have different beliefs. Insofar as these assumptions differ, the latter (economic assumptions) should be incorporated within the ORSA (see discussion of outer and inner simulations below).

26) *Cash flow matching*
27) *Reinvestment risk (implicitly hidden b/t CF matching and the RFR)*
28) *Risks not covered in the SII SF/IM*
29) *SII SCR (SF/IM) stress magnitudes (e.g. mort, long, lapse)*
30) *The SII Best Estimate is benign. Should a market crash feature in a Best Estimate?*

COMMENTS from drafting team

To me, one of the key roles of the ORSA is to pick up risks that are not quantified in the SCR but which, nevertheless are very relevant to the business. I suspect this is the point of the EAN at which they should be discussed.

Could an 'actuary check list' be done somewhere in EAN? It would give the actuary a quick list on what he/she needs to know (or to know that somebody else in the company ORSA process knows) when starting the work? Some point for the check list from section 3.2:

What is company's risk appetite and through which measures is this expressed?

What is the risk profile of the business? What risks can be ruled out? What are the risks that can be quantified and what needs to be included qualitatively? Drawing a risk map can be helpful here.

Into what questions are the scenarios used in ORSA answering? Are these of the interest of the business managers?

Could EAN introduce some ways how to draw a **risk map** in part of ORSA work? It could be a good tool to understand which risks to include or exclude and which can be quantified and which cannot?