

Q 140. Non-life exposures should be reported based on the location of risks to ensure consistency across IAIGs. Regarding the reporting segment, which of the following should be used:

A more compact standardised segmentation? If “yes”, please explain the rationale. [Click here to enter text](#)

A more detailed reporting segmentation based on existing jurisdictional reporting segments?

If “yes”, please explain how consistent treatment across segments could be ensured. [Click here to enter text](#)

Yes – Jurisdictional Reporting should be used:

Notwithstanding the comments noted further below, we believe ICS should make use of existing jurisdictional reporting segments, wherever possible, because:

- **Many jurisdictions have calibrated standard formulas and those calibrations (not necessarily the factors themselves, as different jurisdictions have different standards) can provide the basis for ICS calibrations.**
- **The jurisdictional segments reflect risk as understood by those closest to the business.**
- **If jurisdictional reporting is inadequate, the overall safety of the insurance system will be improved in the long run by encouraging higher standards in all jurisdictions.**
- **The accuracy of classification coding is improved if the coding is used for multiple purposes.**
- **Regardless of the jurisdiction basis, the results can be consolidated into whatever buckets ICS chooses to use.**

Note 1:

The points above are most practical in the US and EU where there the ICS regions correspond to the existing RBC systems and common reporting framework. In those regions, we believe the jurisdictional reporting segments should be used. There are regions that do not have common reporting frameworks. In those regions something else might be necessary. The CD does not provide enough detail from IAIG reporting for us to comment in depth on those situations.

Note 2:

Companies, particularly reinsurers, may not have “location of risk” on all policies. Even if companies have some jurisdictional data, non-local companies may not have segmentation in the same detail as local companies

We assume ICS will allow companies to apply reasonable allocation procedures when that is the case.

Q141. Should projected net earned premiums be used as the exposure base for Premium risk? If “no”, please specify what other measure should be used and why.

Answer: “No”

We suggest that:

The default exposure base for capital calculations answer should be the higher of the (a) the prior year net written premium and (b) prior year net earned premium.

We make that suggestion because:

- 1. A standard formula is necessarily an approximation for any individual company.**
- 2. The standard formula should reflect the more material differences between companies.**
- 3. Subject to the forgoing, where possible, a standard formula should use routinely available, verifiable information (thus, generally, accounting information), because:**
 - a. That information will be more reliable and consistent between companies.**
 - b. That information requires little or no extra cost to obtain.**
- 4. We do not expect that premium volume for IAIGs would vary from year to year in ways that materially affect their indicated capital levels.**
- 5. We do not expect that IAIGs would routinely have business forecasts for the particular details required for ICS, even though they would have premium forecasts that fit their management process.**
- 6. While the Solvency II Standard Formula (SF_SCR) requires forecasts, we note that**
 - a. SF_SCR is applied to companies of all sizes, especially smaller companies that do not use internal models, and smaller companies are more likely to have more significant year-to-year changes in premium;**
 - b. US RBC and Standard Formulas in Canada, for example, do not require forecast premiums, and, to our knowledge, have not experienced difficulties in the indicated capital requirements due to premium changes.**
- 7. Changes in premium from year to year could be one of the many factors that IAIS, through group regulators, monitor and address, if necessary in later versions of ICS.**

Q142. Should net current claims estimates be used as the exposure base for Claims Reserve risk? If “no”, please specify what other measure should be used and why.

“Yes”.

Comments: We assume the definition of current estimate is undiscounted in this exercise, and we point out that, at least in Solvency II, this exposure base cannot be negative.

Q143 Is the approach adequate to account for diversification effects in Premium and Claims Reserve risks?.

Proposed Answer:

No

See our response to question 151.

In addition, we note that the proposed approach is plausible, but we recommend that the approach should be tested with data from IAIGs and/or other sources, such as standard formula calibration data in various jurisdictions.

Q144 Section 6.10.4.2 Are the correlation factors appropriate for the ICS standard method? If “no”, please provide rationale and alternative suggestions supported by evidence.

Yes No

First, see our response to question 151.

In addition, we observe that the correlation factors in the 2015 Field Testing appear to be based on whether the line of business is long tail or short tail. That is one plausible approach.

We recommend testing the alternative hypothesis that the relationship is the same for all lines of business. We suggest that alternative as the relationship between premium risk and reserve risk may also depend on the proportion of reserve that uses premium as an exposure basis. That exposure basis relationship may not be as different between long tail and short tail as implied to the testing factors.

Q145 Section 6.10.4.2 Is the 50% correlation factor between categories appropriate for the ICS standard method? If “no”, please provide rationale and alternative suggestions supported by evidence.

Yes No

See our response to question 151.

The 50% correlation factor between major lines of business categories is a reasonable starting point, but the value could be calibrated (or at least tested) based on data collected in 2016 Field testing. See reply to Question 151.

Q146 Section 6.10.4.2 **Is the 25% correlation factor between regions appropriate for the ICS standard method? If “no”, please provide rationale and alternative suggestions supported by evidence.**

Yes No

See our response to question 151.

The 25% correlation factor between major regions is a reasonable starting point, but the value could be calibrated (or at least tested) based on data collected n 2016 Field testing.

We suggest IAIS test the HHI approach and Max Line % approaches, as described in response to question 151.

Q147 Is there a methodology that the IAIS could use for the calibration of Premium and Claims Reserve risk factors that can be easily and consistently applied across jurisdictional lines of business using the supplementary data requested in 2016 Field Testing?

Proposed Answer: “no”

Comments: There are a number of different approaches available. The “best choice” will be influenced strongly by the (non-)availability of data, which might well depend on markets and regions. See, for example, the considerations of EIOPA during the calibration of the standard formula of Solvency II (cf. EIOPA 11-163 Calibration of the Premium and Reserve Risk Factors in the Standard Formula of Solvency II, Dec 2011, Sections 4.2 and 7), when a number of different approaches were considered, but in the end a premium-risk type approach has been preferred due to its consistency with the premium risk calibration. Actuarial work on the US RBC factors all use the “premium-risk type approach, for both premium risk and reserve risk.

There are a number of additional topics to consider, e.g. the availability of net vs. gross data, some lines which are based on underwriting year triangles in some markets and the definition and accounting of catastrophes in the data set. One particular topic to point out is that there will be a need for an automated way of data

cleansing, i.e. handling of outliers in the underlying data, in order to achieve reliable estimates for risk factors.

We discuss this further in our response to question 151.

Q148 In the absence of adequate data, is there a way the IAIS could determine appropriate risk factors for lines of business?

Proposed Answer: “no”

Comments:

Since regions as defined by IAIS do not coincide with jurisdictions, a direct transfer or averaging of risk factors from local jurisdictions to IAIS does not seem appropriate.

In addition, local regulations may be so different that they could not serve as a consistent basis for international capital requirements. This being said, local factors or results from companies internal models can always serve as a benchmark for final factors after these have been derived from a solid data basis.

We discuss this further in our response to question 151.

Q149 Is there a methodology that the IAIS could use to determine the appropriate number of buckets and factors, taking into consideration the context of the ICS standard method and the aim to achieve comparable results across comparable risks?

Proposed Answer: “no”

Comments: There is no existing standardized methodology to do so. We propose to use the term of "homogeneous risk groups" as a basis for the definition of buckets. In doing so, data availability will be a limiting factor and statistical stability should be considered. The number of buckets used in local regulation can be used as a benchmark.

We discuss this further in our response to question 151.

Q150 Are there practical methods for determining data adjustments?

Proposed Answer: “no”

Comments: Again, there is no existing standardized methodology to do so. However it will be important to request attritional triangle data which is cleaned from catastrophes as far as possible. Automated ways for data cleansing have been

developed, see EIOPA 11-163.

We discuss this further in our response to question 151.

Q151 Are there any further comments on Premium and Claims Reserve risks?

Proposed Answer: “Yes”

Comments:

General Comments Related to Calibration Treatment of Non-Life premium and claim risk charges and diversification/correlation factor

The CD includes a number of questions regarding the calibration of non-life diversification/correlation/dependency (questions 143-146) and calibration of risk factors (147-150).

We have consolidated some general comments on these issues in this section. These comments represent only a number of important issues on this subject. The global actuarial community would appreciate the opportunity to further assist in the calibration of risk factors and dependency relationships, along the lines of how the actuarial community has assisted in the development of standard formulas in many jurisdictions.

One over-arching observation is the recommendation that ICS should have as an objective, that ultimately all risk factors are calibrated based on data. Clearly, on day-one there will be factors based on expert judgement, but over time, it should be IAIS policy to collect data and test factors, such that the factors become increasingly data-driven.

The following more detailed response has three parts. First, we comment on risk charge calibration. Second, we comment on dependency calibration. Finally, we provide an appendix with further details on risk charge calibration.

1. RISK CHARGE CALIBRATION (NON-LIFE UNDERWRITING)

Summary

Based on our current knowledge, we recommend developing ICS risk factors from local jurisdiction standard formula calibrations, adjusted to the desired ICS safety level, adjusted to reflect the IAIG typical company size and perhaps other IAIG characteristics.

Building risk factors on this basis will necessarily be affected by data availability. However, we are confident that building from existing calibration models can be applied in jurisdictions with the largest nonlife insurance premiums, including the US and EU.

In applying this approach there are policy decisions and methodologies that can be applied widely, if not universally. The sections below illustrate some such aspects of the calibration for ICS.

Use of ICS-specific factors

We recommend developing ICS risk factors from local jurisdiction standard formula calibrations, adjusted to the desired ICS safety level, adjusted to reflect the IAIG typical company size and perhaps other IAIG characteristics.

Our reasons include the following:

- 1. Use of exiting work by jurisdiction is possible - We have high confidence that is possible for the US and EU, given the work done in those jurisdiction in RBC and Solvency Standard Formula (SF-SCR). It may also be practical in other jurisdictions**
- 2. Time frames - ICS 1.0 and 2.0 have intended implementation dates of mid-2017 and mid-2018. Bespoke standard formula calibrations for nonlife premium and claim risk charges have generally taken much more time than is available for ICS.**
- 3. Data adequacy – It is likely that IAIG data alone is not adequate for reliable calibrations; not enough companies to produce a data-driven result, for example.**
- 4. Long term maintenance – Risk factors are not static. Underlying conditions change and methods of standard formula calibration improve. Factors developed from jurisdiction-based analysis can be kept up-to-date with far less effort than stand-alone ICS factors.**
- 5. Raising global standards – An effort to adapt jurisdictional factors to fit the ICS framework may advance current practices in jurisdiction-specific risk factors, around the world, to the benefit of regulatory capital procedures at all jurisdiction levels.**

Limitations

We make our comments recognizing that modifications in the approach will be necessary for reasons that include the following: some jurisdictions have no standard capital formula; the calibration methods from some jurisdictions may not support the adaptation to the ICS approach; there are countries that are not now part of region-wide formulas, and separate country-specific formulas will need adjustments to reflect consolidation and geographic diversification within their ICS region.

Relationship to Question 140 – In question 140, we reply that data should be applied by jurisdiction. One of our reasons for that reply was our view that calibrating factors should be done on that basis and that existing data to support the calibration is available on that basis.

Target Safety Level

Selecting the VaR is level is not a sufficient definition for premium and claim risk charges. Paragraph 293 indicates that IAIS is testing based on a VaR 99.5% target safety level. However, there are at least three ways to apply the VaR standard that standard: Percentile, Percentile minus Mean, and Standard Deviations. These applications produce different risk charges.

- 1. Percentile Approach - In the percentile approach the risk charges are the operating losses or reserve runoff values at the selected safety level, e.g. 99.5%. This is the approach underlying actuarial recommendations related to the US RBC system.**
- 2. Percentile minus Mean - The indicated risk charges could be determined as (a) the difference between the mean value operating gain/losses and reserve runoff and the operating gain/loss and reserve runoff at the target values at risk (e.g., 99.5th percentile).**
- 3. Multiples of the standard deviations – This is based on determining the standard deviation (for a “typical” premium/reserve level -See discussion below of variation in risk by company volume) combined with an assumption regarding the number of standard deviations required to reach the VaR target level.**

The differences between the methods include the following:

- A. Treatment of Expected Profitability/Reserve Development**
One difference between the three methods is in the treatment of historical pattern of profitability and reserve adequacy. With respect to premium risk, profit margins are generally positive. In the percentile calibration approach the indicated premium risk factors are lower than they would be otherwise, to reflect any such long term profit margin. The other two methods, the ‘percentile minus mean’ and ‘standard deviation’ approaches do not reflect that reduction.
- B. Similarly, with respect to reserve runoff, history shows that, in some business segments, companies tend to set loss reserves that are higher than ultimately prove necessary (“over-reserve”). Reserve runoff risk ratios those lines, therefore, tend to be lower, reflecting that favorable reserve development is likely. The opposite is the case for business segments where companies tend to set low loss reserves (“under-reserve”). In a percentile calibration, the 99.5th (or other safety level) percentile reserve runoff will be lower for the business segments companies tend to over-reserve and higher for the business segments where companies tend to under-reserve.**
- C. The other two methods, the ‘percentile minus mean’ and ‘standard deviation’ approaches, assume that company reserves, on average across companies and over time are accurate for each business segment.**

D. Risk Distribution Assumptions. Another difference between the methods is that for “multiples of standard deviations,” method it is necessary to specify at least certain features of a risk distribution. With the other methods a risk distribution might be specified, but the empirical data could also be used as the risk distribution, at least up to target level that can be calibrated based on data. The Solvency II Standard Formula uses the standard deviation approach.

Recommendation:

Different targets are used in different jurisdiction. Regardless of the approach used in the jurisdiction, the analysis underlying the jurisdiction factors can be adapted to the ICS target calibration.

Calibration Issues

The calibration of standard formula risk factors needs to address issues including the following:(See further details in sources such as: 1)Premium Risk Charges – Improvements to Current Calibration Method (Report 6) <http://www.casact.org/pubs/forum/13fforum/01-Report-6-RBC.pdf> 2)Reserve Risk Charges – Improvements to Current Calibration Method (Report 7) <http://www.casact.org/pubs/forum/14wforum/Report-7-RBC.pdf> 3)Report of the Joint Working Group (JWG) on Non-Life and Health NSLT Calibration, December 2011, “Calibration of the Premium and reserve Risk Factors in the Standard Formula of Solvency II https://eiopa.europa.eu/fileadmin/tx_dam/files/Press-Room/releases/EIOPA-11-163-A-Report_JWG_on_NL_and_Health_non-SLT_Calibration.pdf1)

1. **Data cleansing** - Data must be “cleansed” to remove anomalous values.
2. **Size** - Indicated risk factors vary by company based on the volume of premium and reserves, by company and business segment. The standard formula does not reflect that variation. Therefore, risk by size must be analyzed to select risk charges that are sufficiently acceptable for the purposes of the standard formula.
3. **Years of Experience** - Indicated risk varies by year, so the data must include a sufficient time period, in particular enough underwriting cycles and/or adjust for the gap in the experience period.
4. **Reinsurance** - The treatment of reinsurance in the calibration data should be consistent with the use of reinsurance in the standard formula or else adjustments to indicated risk factors are necessary.
5. **Minor Lines** - In analysis of US data, we find that business segments within a company that are small compared to the company total size (“minor lines”) have higher indicated risk charges than the same business segments, of the

same business segment-size, in companies where the business segment is more significant in business segment-size compared to company-size for all business segments. Minor line data must be treated properly to produce factors that are appropriate for the bulk of the companies against which the risk charges are applied (The proper treatment of minor lines data is particularly important for specialty lines like reinsurance and medical malpractice.)

6. **Survivorship** – Data from companies that are no longer in operation show higher risk factors than companies that continue in operation. To the extent practical, data should include those companies that have ceased operations.
7. **Time Horizon** – IAIS has selected a one year reserve runoff time horizon. To the extent practical, the calibration should assess the extent to which reserve runoff after one year, for companies with adverse runoff, e.g., runoff at the safety level threshold, have unbiased reserved development after year 1. US data shows that for companies at or above the 87.5th percentile of reserve runoff by line of business show adverse development, higher than other companies, after year 1.

DEPENDENCY – NON-LIFE UNDERWRITING RISK

ICS Approach in 2015 Public Testing Template

The ICS standard method, as illustrated by the 2015 Public Testing Template contains four levels of potential diversification, applied in the order listed: (1) between premium risk and reserve risk (2) between 8 [to be determined] sub-line buckets, within each of the four major lines of business categories, (3) between 4 major lines of business categories; and (4) between the 8 major geographic regions.

Alternative Approaches

In our experience, we have observed four methods to reflect dependency in general insurance standard formulas:

1. **No explicit credit for diversification.** Select risk factors that reflect the average degree of diversification. This approach is used (1) explicitly, in the UK Individual Capital Adequacy Standard; (2) implicitly in the US RBC treatment of geographic diversification variation within the US; (3) implicitly in Solvency II treatment non-catastrophe geographic variation within the EU (4) in Canada's current Minimum Capital Test (MCT) and within each of the major global regions worldwide. This approach appears to be the intended treatment for the diversification between the 8 [to be determined] subline buckets within each of 4 major lines of business categories and for countries/sub-regions in the major geographic regions.
2. **Herfindahl- Hirshman-Index (HHI)** –HHI is widely used by economists to measure concentration. HHI considers the relative proportions of all lines of business, the largest, second largest, third largest, and so on (The HHI index

equals the sum of the squares of the LOB shares of total. For example, if there is only one LOB, the HHI index is 1.0, and the diversification is $1 - \text{HHI} = 0\%$. With two lines split 25% and 75% HHI is $0.25^2 + 0.75^2$ or 0.625. With three lines split 50%, 25% and 25% the HHI index is $0.50^2 + 0.25^2 + 0.25^2$ or 0.375. Using HHI in a standard formula requires only one parameter, the maximum diversification allowed for a company with concentration approaching zero. As it requires only one parameter, HHI is, in that sense is simpler than the correlation approach (see item 4) but more complex than the Max Line % Approach (see item 3). HHI is used in the Solvency II geographic diversification credit between global regions.

3. **Simplified HHI (Max Line %) – HHI as described in item 2 above considers the proportion of business in each sub-category. HHI is sometimes simplified and applied to a subset of categories, e.g., the largest single category, or just the two largest categories, or just the three largest categories, etc. (In the simplified HHI, the index equals the sum of the squares of the desired proportions divided by the sum of the values. If there are three lines of business, with 50%, 25% and 25% shares and HHI uses only the two largest lines of business, the simplified HHI would be $0.50^2 + 0.25^2$ divided by $0.5 + 0.25$ or .41). US RBC uses the simplified HHI method, considering only the proportion of volume in the largest line of business for the company. The RBC method is sometimes called Maximum Line % approach, where the diversification credit equals the percentage of premium or reserves in the line with the highest share of business (Max Line % produces a diversification value that is less than or equal to than HHI diversification value. For example, if there is only one LOB, the HHI index is 1.0 with same as the Max Line %. In that case the diversification is $1 - \text{the index}$ or 0% for both. With two lines split 25% and 75% the HHI index is 0.625 (see parenthetical above) compared the Max Line % of 0.750, i.e., it shows less concentration/more diversification. With three lines split 50%, 25% and 25% the HHI index is 0.375 (see parenthetical above), less concentration/more diversification than the Max Line % of 0.5).**
4. **Correlation Matrix – This is the approach used in Solvency II Standard Formula for diversification between lines of business. The Correlation Matrix approach is the one routinely used in individual company capital modeling. The structure of the ICS Public Testing Template is a correlation matrix approach, but the correlation parameters are constants, 25% for geographic diversification and 50% diversification between major lines of business.**

Research Findings

Research (not yet published) by a Casualty Actuarial Society working party [the research being the responsibility of the working party members, not the authors' employers or the CAS] shows the following:

They calculated the premium and reserve RBC values on for each US (re)insurer in 2010, using the correlation matrix approach and using the Max Line % approach, normalizing the two approaches to produce the same industry total RBC value. They find that the differences in RBC values are small (For 79%% of companies with 78% of premium and reserve RBC value, the premium and reserve RBC values are 5% for the two methods. The authors consider 5% small in light of the parameter uncertainty in the risk factors and in the correlation factors) company by company (An analysis of why the different methods produce similar results is beyond the scope of that research. However, three factors that contribute to the similarity are that (1) the

diversification credits are necessarily the same (zero) for mono-line companies regardless of method and therefore close for concentrated but not mono-line companies, (2) after normalization to equalize the total RBC, the diversification credits are similar for both methods for the most diversified companies, and (3) the correlation matrix values are not highly varied).

Comparing indicated diversification credits to the formula credits, the correlation matrix approach is not more accurate than the Max Line % approach, within categories of companies by size and level of diversification.

It might appear surprising that the correlation approach is not “better” than the simple Max Line % approach. The research shows evidence that that “dependency” and “line of business risk charge” are not completely independent. To that extent, dependency, calibrated for a standard formula, reflects more than risk theory diversification. For example, a company concentrated in a single region might have lower loss ratios, less variability in loss ratios, and more accurate reserving, due to specialization, than a company that was diversified across several geographic regions. A company concentrated in a single geographic region might be more diversified within that country than companies with business in several geographic areas.

The research did not examine the dependency of premium risk and reserve risk.

US data shows that the indicated diversification credit for larger and more diversified companies (like IAIGs) is reasonably linear with respect to the simplified Max Line % diversification metric, as assumed by the Max Line % approach.

The advantage of the HHI or Max Line % approaches is that they require only one parameter, far fewer than the dozens/over 100 parameters potentially required by a “full blown” correlation matrix approach. It is more practical to calibrate the single parameter based.

The ICS Template uses a small number of correlation values. Hence ICS calibration is also more practical than a “full blown” correlation approach, but with fewer different correlation values, the differences between HHI and correlation might be smaller.

The Max Line % approach might be suitable for the 8 buckets within each major line of business and/or for country or other segments within the major geographic regions.

Recommendation:

IAIS should test the HHI approach as an alternative to the correlation matrix approach.

Appendix – Examples of Issues Affecting Risk Factor Calibration

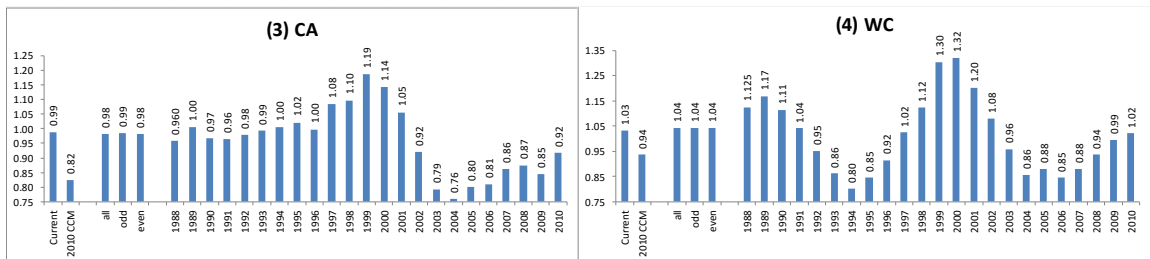
Enough Years of Data

Research in the US has shown that risk charges vary over time, as if in response to underwriting cycles that affect both loss ratios and reserve runoff ratios. For example, Table X-1 below shows the indicated 87.5th percentile loss ratios by year for US commercial auto and workers compensation.

The risk charges vary from year-to-year by so much that 10 years of data, for example, is not sufficient to produce stable risk charges. It was not clear from US data what number of years is sufficient. Examining all available years appears to be the best practice.

Table X-12

Variation in Indicated Premium Risk Factors By Year



Values are 87.5th percentile loss ratios by year. 87.5th percentile reserve runoff ratios and standard deviations for both premium and reserves also show wide variations by year.

We expect that similar variation from year to year would apply at higher percentile levels, although data at the 99.5th percentile is too sparse to allow year-by-year analysis.

² Premium Risk Charges – Improvements to Current Calibration Method (Report 6)

<http://www.casact.org/pubs/forum/13fforum/01-Report-6-RBC.pdf>

Reserve Risk Charges – Improvements to Current Calibration Method (Report 7)

<http://www.casact.org/pubs/forum/14wforum/Report-7-RBC.pdf>

Company Business segment size

Risk is affected by the company size and business segment size, measured as premium or reserves. The actual risk for large business segments within a company is lower than actual risk for the same business in another company with less volume.

However, risk charges in standard formulas, generally, do not do not vary by business segment-size. Hence, smaller business segment-sizes there is a greater chance of exceeding any target loss or reserve runoff ratio than is the case for larger business segment-sizes. Hence, regardless of the calibration method, smaller business segment-sizes will have lower implied safety level and larger business segment-sizes will have higher implied safety levels.

This issue of risk variation by size of business segment may be less significant for IAIGs, as they are large, than it is for standard formulas applicable to companies of all size. We do not have the data to assess that. However, even large companies will have smaller business segments and this will be more applicable in jurisdictions with smaller insurance markets than jurisdictions with larger insurance markets.

Selecting risk factors is a balance³ between the following:

“Company view” – the share of insurers that meet the target security level by business segment. This could be called “unweighted portfolio view.”

“Policyholder view” – the share of premium or policyholders (or share of reserves or claimants in the case of reserve risk) that are insured with companies that meet the target security level by business segment. This could be called “weighted portfolio view.”⁴

³ This issue, called “Compliant Share” in Solvency II. The Solvency II perspective is described in Report of the Joint Working Group (JWG) on Non-Life and Health NSLT Calibration, December 2011, “Calibration of the Premium and reserve Risk Factors in the Standard Formula of Solvency II, page 1`8.”

⁴ The terms Company View and Policyholder View are from JWG. We recognize that premium and claim reserves reflect many variables in addition to the number of policyholders and claimants. These might be called the weighted portfolio method (Policyholder view) and unweighted portfolio method (Company View). . We believe the reference is useful as a non-technical way to express an important element of the two ways to view the calibration standard.

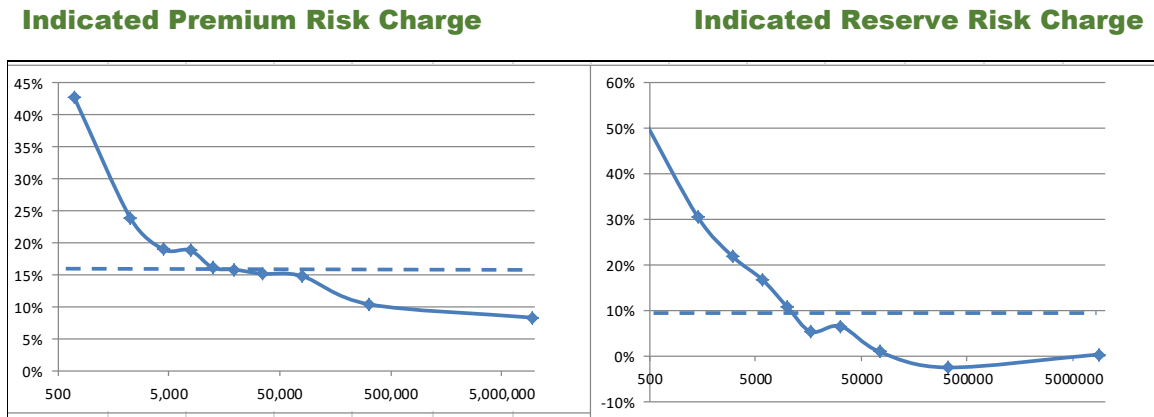
As larger business segment-sizes generally indicate lower UW variability than smaller business segment-sizes, the RBC and SF_SCR Formulas achieve higher safety levels from the Policyholder View than from the Company View.

We can see the relationship between risk charges and size looking at indicated risk charges by size. For example, Table X-2 shows the indicated PPA premium and reserve risk charges decrease with increasing business segment-size.⁵ The solid lines, with diamonds show the indicated risk charges by business segment-size. The risk charge for the smallest 15th percentile business segment-sizes, the left-most point on the chart, shows an indicated reserve risk charge of over 40% for premium and over 50% for reserves.

The horizontal line represents the risk factor indicated by excluding the smallest 15th percentile business segment-size, by year. That is another approach to addressing the “size” issue.

Table X-26 – PPA

**Graphical Representation of Risk Charge as % of Premium and Reserves
Variation by business segment-size (000's)**



We can also see the relationship examining the risk by size based on modeling.

⁵ These are the 87.5th percentile loss ratios and runoff ratios, based on a lower calibration target than intended for ICS. The concept is applicable to higher safety levels.

⁶ Adapted from data used in Report 6 and Report 7, referenced in footnote 2.

Tables X-3 and x-4 show results for the US general liability insurance and the US private passenger automobile liability business segments.

The diamonds and triangles represent the results of the “company model” and “industry model” of the Joint Working Group on Non-life and Health NSLT Calibration, developed for solvency II risk factor calibration and applied to US data. The squares represent the indicated risk charges by company size, comparable to the values in Tables X-2.

Table X-3

US Private Passenger Automobile Liability – Premium Risk Charges (9,787 data points)

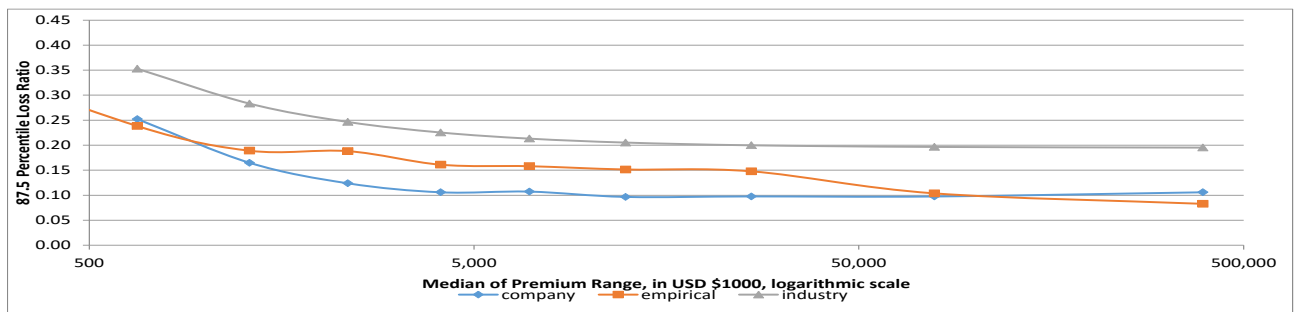
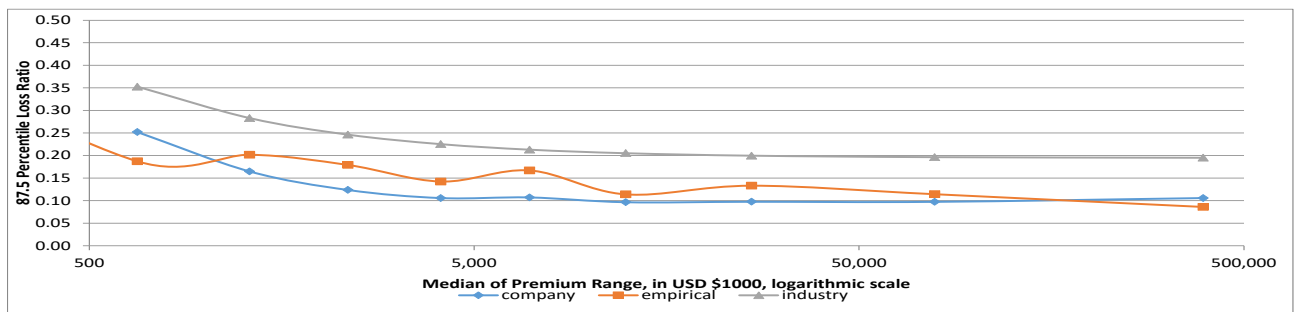


Table X-4

US General Liability– Premium Risk Charges (10,459 data points)



PARTIAL BIBLIOGRAPHY:

Premium Risk Charges – Improvements to Current Calibration Method (Report 6)

<http://www.casact.org/pubs/forum/13fforum/01-Report-6-RBC.pdf>

Reserve Risk Charges – Improvements to Current Calibration Method (Report 7)

<http://www.casact.org/pubs/forum/14wforum/Report-7-RBC.pdf>

Differences in Premium Risk Factors by Type of Company (Report 8)

<http://www.casact.org/pubs/forum/14spforum/01-RBC-Dependencies-Calibration-Working-Party.pdf>

**Differences in Premium and Reserve Risk Charges by Ceded Reinsurance Usage
(Report 9)**

http://www.casact.org/pubs/forum/14fforumv2/DCWP_Report.pdf

**Reserve Risk Charges – Standard Formula vs. Individual Company Assessments
(Report 10)**

Winter 2015 forum

<http://www.casact.org/pubs/forum/15wforum/DCWP-Report.pdf>

RBC UW Risk Safety Levels – Actual vs. Expected (Report 11)

<http://www.casact.org/pubs/forum/16wforum/DCWP-Report.pdf>

**Calibration of the Premium and reserve risk Factors in the Standard Formula of
Solvency II, Report of the Joint Working Group on Non-Life and Health NSLT
Calibration, 12 December 2011**

https://eiopa.europa.eu/fileadmin/tx_dam/files/Press-Room/releases/EIOPA-11-163-A-Report_JWG_on_NL_and_Health_non-SLT_Calibration.pdf

**Financial Condition Reporting for South African Short Term Insurers, Calibration
Project, December 2005**

<https://www.fsb.co.za/Departments/insurance/archives/Documents/Amended%20Deloitte%20Recalibration%20report.pdf>