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Using Relevant Experience Data to Increase Credibility and Reduce Margins

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Principle-based reserves (PBR) and other risk analyses have raised the bar for setting assumptions and establishing margins for material assumptions. Under PBR, documentation requirements are more detailed and include describing the sources of assumptions and the process for setting margins. The size of margins must be related to the level of uncertainty in the assumptions, including the degree of credibility in the historical experience underlying each material assumption. A company with relevant historical experience for material assumptions that is less than 100 percent credible must either find relevant industry experience to increase the credibility of its own historical experience or set wider margins due to the greater uncertainty in setting the assumptions using company experience alone.

The following is an excerpt from Section 9C of VM-20 permitting the use of similar experience from other sources in setting a company's mortality experience assumption:

b. Company experience data shall be based on experience from the following sources:

i. Actual company experience for books of business within the mortality segment.

ii. Experience from other books of business within the company with similar underwriting.

iii. Experience data from other sources, if available and appropriate, such as actual experience data of one or more mortality pools in which the policies participate under the term of a reinsurance agreement. Data from other sources is appropriate if the source has underwriting and expected mortality experience characteristics that are like policies in the mortality segment.

c. The company experience mortality rates shall not be lower than the mortality rates the company expects to emerge which the company can justify and which are disclosed in the PBR Actuarial Report.

Other terms used in regulations and actuarial literature that describe the appropriateness of the "other experience" to the company experience are *relevant* and *directly applicable*.

Current industry experience studies, such as the study underlying the 2015 Valuation Basic Table (2015 VBT) tend to be highly aggregated, meaning that while the impact of underwriting rules and other factors such as gender, smoking status, policy size, issue age and duration are analyzed, other important factors are not. These other important factors might include product type and design elements, distribution channel characteristics and target markets and the interdependence of material risk factors (such as lapse and mortality experience, especially for term products).

Therefore, companies need to be cautious about applying the results of a highly aggregated study as "relevant experience" in the process of assumption setting under PBR or any risk analysis process.

CENTRAL ESTIMATE ASSUMPTIONS

For the purposes of this discussion, the term *central estimate assumptions* refers to assumptions that combine relevant company experience (that is less than 100 percent credible) and industry experience for the material or key risks underlying a product to develop baseline assumptions for modeling those material risks in cash flow projection models. Where relevant company experience for a material risk is 100 percent credible, that experience (with consideration of possible trends) for the key risk would be the central estimate assumption. When there is less than 100 percent credibility, the relevant company experience can be credibility-blended with relevant industry experience (with consideration of possible trends) to establish the central estimate assumptions for a material risk.

RELEVANT EXPERIENCE

In this context, *relevant* means the experience is directly applicable to the expected experience of the material risk(s) under consideration. Depending on the risk factor, traditional experience studies may not have identified all significant predictors, which may include the following:

1. Product design elements, including the configuration of riders on a policy;

2. Distribution characteristics, including producer characteristics and compensation patterns;

3. Target markets, including customer characteristics and how the products will be used, such as qualifying for tax-related advantages; and

4. Dynamic policyholder behavior functions reflecting scenario-dependent factors, such as the in-the-moneyness of a benefit.

Where appropriate, both company and industry experience studies should be designed to identify the significant predictors beyond the traditional predictors used in the past.

LIMRA, MIB and other data aggregators have been working with the Society of Actuaries (SOA) on the development of enhanced experience studies that identify significant predictors of experience. These enhanced studies could serve as the basis for identifying industry experience that is relevant to company experience.

Company experience that is used to establish expected experience should also be evaluated for relevance. Enhanced industry studies can provide a road map for enhanced company experience studies. However, a company usually has more detailed information about its business than data aggregators do. In some cases, industry studies show the "company code" as one of the key predictors of experience. In this context, the company code serves as a proxy for additional information about the business to which the data aggregator does not have access. With more detailed information, the company can identify additional predictors for which company code is a proxy in industry studies and provide feedback to data aggregators to improve those industry studies.

Aligning the key predictors between industry and company experience can serve as the basis for identifying relevant industry experience to supplement company experience in establishing the central estimate assumptions for use in pricing, PBR and other risk analysis. With the combined experience producing higher credibility measures, smaller margins for uncertainty would be needed.

If relevant industry experience is not available to or not considered by the actuary, company experience alone can be used for a key risk, but the lower credibility of using only company experience would result in greater uncertainty in the assumptions and larger margins. In this case, the company experience would become the central estimate assumption for that key risk.

In the case of an emerging key risk (like one associated with a new benefit) for which neither company nor industry experience is available, the actuary would use professional judgment in setting the central estimate assumption. However, this lack of historical experience would result in a correspondingly wide probability distribution and margin for that risk, appropriate to the high level of uncertainty. Following these principles would minimize the risk of underpricing and under-reserving products with new benefits.

See the Appendix for references to the term *relevant* in the Exposure Draft of the Actuarial Standard of Practice (ASOP) on setting assumptions and in Section 20 of the Valuation Manual (VM-20). The concept of relevance is also included in many other ASOPs and sections of the Valuation Manual.

CALCULATING THE CREDIBILITY OF COMPANY EXPERIENCE FOR MATERIAL RISKS

Per VM-20, there are two basic methods for calculating credibility: the limited fluctuation method and the Bühlmann method. The latter requires a company to have access to industry-level information. Data aggregators might help provide the industry perspective needed for the Bühlmann method, which in many instances appears to produce higher credibility values. The credibility of the relevant industry experience could likewise be calculated.

CREDIBILITY-BLENDING COMPANY EXPERIENCE AND RELEVANT INDUSTRY EXPERIENCE FOR KEY RISKS

With respect to formally including relevant industry experience in the assumption-setting process, VM-20 provides a road map for a credibility-blending process specific to the mortality assumption for the deterministic reserve and the stochastic reserve. Please note that this process can be applied to other key assumptions as well. While VM-20 applies to setting modeling assumptions for the PBR deterministic and stochastic reserve calculations, the credibility-blending process is a sound methodology for developing central estimate assumptions for other risk analysis purposes, including pricing.

DEVELOPING REDUCED MARGINS DUE TO HIGHER CREDIBILITY

Margins can be developed either for individual material assumptions or as an aggregate margin for the material assumptions taken together. Despite different details in the calculations, these two approaches should produce results of the same magnitude and may serve as a cross-check for each other, including calibrating the covariance adjustment on individual margins.

To develop prudent estimate assumptions from the anticipated experience assumptions, VM-20 Section 9B.2 provides guidance in setting margins:

> The greater the uncertainty in the anticipated experience assumption, the larger the required margin, with the margin added or subtracted as needed to produce a larger modeled reserve than would otherwise result. For example, the company shall use a larger margin when:

A new tool is being developed that can assist the actuary in establishing margins based on levels of uncertainty.

a. The experience data have less relevance or lower credibility.

b. The experience data are of lower quality, such as incomplete, internally inconsistent, or not current.

c. There is doubt about the reliability of the anticipated experience assumption, such as, but not limited to, recent changes in circumstances or changes in company policies.

d. There are constraints in the modeling that limit an effective reflection of the risk factor.

A new tool is being developed that can assist the actuary in establishing margins based on levels of uncertainty. The SOA has funded a project that explores simplified PBR methods. One of the deliverables of this project is a multi-risk scenario generator that produces both economic scenarios (consistent with the SOA/American Academy of Actuaries economic scenario generator) and scenarios for the other material risks identified by the company. With the user supplying the company's actual to expected ratio for each material assumption, the number of observed events, the exposure and the probability distribution type, the generator can produce scenarios for each material assumption at specified probability levels.

For example, if moderately adverse experience is about the 84th percentile of the probability distribution, then sensitivity tests could be run for each of the material risks using 84th percentile scenarios produced by the multi-risk scenario generator. Taking the differences between the present value of future cash flows for each sensitivity test and the baseline run using central estimate assumptions and then applying a covariance adjustment, an aggregate margin could be derived. One option for the covariance adjustment would be a square root formula analogous to the covariance adjustment for the life risk-based capital process, with consideration of the independence or dependence of the material risks.

The multi-risk scenario generator scenarios will produce narrower distributions for the material risks when more relevant historical experience underlies the central estimate assumptions. As a simple example, assuming mortality rates have a Poisson distribution, adding four times more data to a company's experience from relevant industry experience would reduce the extra mortality in the 84th percentile sensitivity testing factors by 55 percent to 60 percent.

CASE STUDY—USING REINSURER DATA

In addition to industry studies by data aggregators such as LIMRA and MIB, reinsurers may partner with companies in providing relevant historical experience to supplement company experience in setting assumptions and margins. This approach may be needed when other data aggregators have not yet produced enhanced experience studies identifying the significant predictors for a material risk.

For example, consider the case of a reinsurer providing experience to a direct writer to use in setting the mortality assumption for a term life insurance product. The key issues are twofold: (1) the relevance of the company and reinsurer experience to the expected future experience of the new product; and (2) the combination of relevant company and industry experience to develop the central estimate mortality assumptions for pricing as well as the anticipated experience assumption for mortality in the VM-20 reserve calculations. Issue 2 becomes important only if issue 1 is satisfied.

With respect to issue 1, the reinsurer may select a block of reinsured term life insurance business for which it has recent first-dollar historical experience with underwriting rules and risk class structures like those that will be used for the new product. In addition, it may consider other factors such as level premium periods, pattern of post-level term premiums (including size of premium jumps), presence of a return of premium (ROP) benefit and type, method of distribution and pattern of compensation, level of competitiveness and distribution of face amounts and gender.

Based on the limited fluctuation method, the company's relevant fully underwritten experience will be calculated based on face amount and/or policy count. If there is an extremely wide distribution of face amounts, credibility based on policy count may be preferable. The same calculations will be done for the reinsured business.

Ratios of relevant reinsurer mortality experience to relevant company mortality experience will be calculated. These ratios will be evaluated with respect to the direction and magnitude of the differences from 100 percent. Confidence intervals may be established based on credibility levels but should be used with care. The width of the distribution of reinsurer experience should also be considered.

A wide distribution of reinsurer experience may indicate either of the following: (1) outliers that might be better excluded impacting the distribution; and/or (2) the impact of other important factors that have not yet been analyzed in selecting the reinsurer experience.

To refine the reinsurer experience with respect to its relevance to the company experience, the following steps may be followed:

1. Consider the distribution in experience by company within the reinsurer experience and group the companies by the level of their relative experience, particularly for the most important risk classes. Select the grouping that appears to align best with the company's experience overall and for the most important risk classes.

2. Confirm that the face amount and underwriting class distribution are reasonable.

3. Calculate the credibility of this refined reinsurer experience.

4. Calculate the reinsurer to company experience ratios overall and by gender and risk class.

5. Perform statistical tests to confirm that the company's experience is within reasonable parameters.

6. If the ratios in step 4 are reasonably close to 100 percent, develop the mortality assumption as the credibility-weighted blending of the relevant company experience and the relevant peer group experience.

CONCLUSION

When company historical experience for a material risk is less than 100 percent credible, relevant industry experience can be used to supplement that company experience to develop central estimate assumptions for setting pricing assumptions, anticipated experience assumptions for PBR and cash flow projection assumptions for other purposes. Enhanced experience studies at the industry and company levels may identify additional significant predictors of experience that can be used to identify relevant industry experience and, in turn, to increase the credibility of the experience underlying the company's material assumptions and reduce the margin for uncertainty. Data aggregators such as LIMRA, MIB and others (including reinsurers) should be encouraged to develop enhanced experience studies to identify the significant predictors of experience and dynamic policyholder behavior functions that will serve as a road map for further individual company analysis using additional detailed information available at the company level. Enhanced company experience studies can then feed these additional predictors back to data aggregators to help improve industry studies and enable data aggregators to do a better job of providing relevant industry experience for the use and benefit of companies.

EXCERPTS FROM VM-20 AND THE DRAFT ASOP ON SETTING ASSUMPTIONS

These excerpts illustrate the uses of the term *relevant* in the Exposure Draft ASOP on setting assumptions and in VM-20. Note also the frequency with which the words *available* and *credible* accompany the references to *relevant*. This illustrates the importance of using relevant experience data to increase credibility.

ASSUMPTION SETTING EXPOSURE DRAFT

3.1.1 General Considerations—The actuary should set assumptions that are reasonable for the intended purpose, or, if other parties have the responsibility for setting assumptions, assess whether the assumptions set by others are reasonable for the intended purpose. The actuary should consider the following:

b. available and **relevant** data, including, where appropriate, the credibility of any such data as discussed in ASOP No. 25, Credibility Procedures;

c. other available and **relevant** information; and

d. whether there are reasons to expect that future experience will differ significantly from past experience.

3.4 Reliance on Others—Data and analyses **relevant** to the assumptions may be available from a variety of sources, including the principal, representatives of the entity, investment advisers, demographers, economists, scientists, statisticians, health care providers and other professionals. When the actuary is responsible for setting assumptions or assessing the reasonableness of assumptions set by others within the scope of this standard, the actuary may consider and incorporate the views of such experts, but the setting or assessment of assumptions should reflect the actuary's professional judgment. If the actuary states reliance on other sources and disclaims responsibility for any material assumption selected by a party other than the

actuary, the actuary should disclose such reliance in accordance with section 4.2(b).

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Section 9.A.6. The company shall use its own experience, if **relevant** and credible, to establish an anticipated experience assumption for any risk factor. To the extent that company experience is not available or credible, the company may use industry experience or other data to establish the anticipated experience assumption, making modifications as needed to reflect the circumstances of the company.

a. For risk factors (such as mortality) to which statistical credibility theory may be appropriately applied, the company shall establish anticipated experience assumptions for the risk factor by combining **relevant** company experience with industry experience data, tables or other applicable data in a manner that is consistent with credibility theory and accepted actuarial practice.

b. For risk factors (such as premium patterns on flexible premium contracts) that do not lend themselves to the use of statistical credibility theory, and for risk factors (such as the current situation with some lapse assumptions) to which statistical credibility theory can be appropriately applied but cannot currently be applied due to lack of industry data, the company shall establish anticipated experience assumptions in a manner that is consistent with accepted actuarial practice and that reflects any available **relevant** company experience, any available **relevant** industry experience or any other experience data that are available and **relevant**. Such techniques include:

    i. Adopting standard assumptions published by professional, industry or regulatory organizations to the extent they reflect any available **relevant** company experience or reasonable expectations;

    ii. Applying factors to **relevant** industry experience tables or other **relevant** data to reflect any available **relevant** company experience and differences in expected experience from that underlying the base tables or data due to differences between the risk characteristics of the company experience and the risk characteristics of the experience underlying the base tables or data;

    iii. Blending any available **relevant** company experience with any available **relevant** industry experience and/or other applicable data using weightings established in a manner that is consistent with accepted actuarial practice and that reflects the risk characteristics of the underlying policies and/or company practices.

c. For risk factors that have limited or no experience or other applicable data to draw upon, the assumptions shall be established using sound actuarial judgment and the most **relevant** data available, if such data exist.

The qualified actuary to whom responsibility for this group of policies is assigned shall annually review **relevant** emerging experience for the purpose of assessing the appropriateness of the anticipated experience assumption. If the results of statistical or other testing indicate that previously anticipated experience for a given factor is inadequate, then the qualified actuary shall set a new, adequate, anticipated experience assumption for the factor.

Section 9.2.B.2. The greater the uncertainty in the anticipated experience assumption, the larger the required margin, with the margin added or subtracted as needed to produce a larger modeled reserve than would otherwise result. For example, the company shall use a larger margin when:

a. The experience data have less **relevance** or lower credibility.

Section 9.2.D.1. The company shall determine prudent estimate policyholder behavior assumptions such that the assumptions:

d. Reflect the outcomes and events exhibited by historical experience only to the extent such experience are **relevant** to the risk being modeled.

Section 9.2.D.3. Margins for Prudent Estimate Policyholder Behavior Assumptions

The company shall establish margins for policyholder behavior assumptions in compliance with subsection 9.B subject to the following:

a. To the extent that there is an absence of **relevant** and fully credible data, the company shall determine the margin such that the policyholder behavior assumption is shifted toward the conservative end of the plausible range of behavior, which is the end of the range that serves to increase the modeled reserve.

b. The company must assume that policyholders' efficiency will increase over time unless the company has **relevant** and credible experience or clear evidence to the contrary.

Section 9.2.D.4. Additional Sensitivity Testing for Policyholder Behavior Assumptions

The company shall examine the sensitivity of assumptions on the modeled reserve as required under Subsection A.3 of this section and shall at a minimum sensitivity test:

a. Premium payment patterns, premium persistency, surrenders, partial withdrawals, allocations between available investment and crediting options, benefit utilization and other option elections if **relevant** to the risks in the product;

Section 9.2.D.6. For a term life policy that guarantees level or near level premiums until a specified duration followed by a material premium increase, or for a policy for which level or near level premiums are expected for a period followed by a material premium increase, for the period following that premium increase the lapse and mortality assumptions shall be adjusted, or margins added, such that the present value of cash inflows in excess of cash outflows assumed shall be limited to reflect the **relevance** and credibility of the experience, approaching zero for periods where the underlying data have low or no credibility or **relevance**. ■

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Are you interested in getting involved with the Financial Reporting Section but don't know where to start? Continue to check the new SOA volunteer opportunities list (https://engage.soa.org/volunteeropportunities) to find a job that suits your skills and availability!

Editorial Correction

In the June 2017 issue of *The Financial Reporter,* the author bio and photo for Shaowei Yang were omitted from the article "Setting Ascribed Premiums for Market Risk Benefits under FASB Targeted Improvements." The editorial staff of the SOA apologizes for the error and regrets any confusion the error created. The correct author bio and photo are as follows.

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